REPORT RESUMES

ED 003 418 24
STRATEGIES FOR BEHAVIORAL RESEARCH IN MENTAL RETARDATION--A SEMINAR REPORT.
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WISCONSIN UNIV., MADISON, SCH. OF EDUC.
REPORT NUMBER CRP-G-1 PUB DATE 61
EDRS PRICE MF-$0.27 HC-$7.04 176P.

DESCRIPTORS- SEMINARS, *BEHAVIORAL SCIENCE RESEARCH, *MENTAL RETARDATION, RESEARCH METHODOLOGY, RESOURCE GUIDES, *RESEARCH COMMITTEES, PERSONALITY, INTELLIGENCE, MADISON, WISCONSIN

A SEMINAR WAS HELD DURING THE SUMMER OF 1961 TO EXPLORE THE RESEARCH NEEDS IN THE BEHAVIORAL ASPECTS OF MENTAL RETARDATION. THIRTEEN SPECIALISTS DISCUSSED AND STUDIED THESE NEEDS AND ESTABLISHED GUIDELINES FOR SUCH AREAS OF STUDY AS (1) NATURE AND DETERMINANTS OF INTELLIGENCE AND ITS DEVIATIONS, (2) PSYCHOLOGICAL DETERMINANTS OF MENTAL RETARDATION, (3) PERSONALITY CONCOMITANTS OF MENTAL RETARDATION, (4) TREATMENT, (5) ADMINISTRATION OF RESEARCH, AND (6) LEARNING, MOTIVATION, AND PERCEPTION. FINAL REPORTS WERE PRESENTED IN EACH OF THESE RESEARCH AREAS, WHICH EXPRESS THE JUDGMENTS OF A NUMBER OF INVESTIGATORS, TEACHERS, AND ADMINISTRATORS. (RS)

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STRATEGIES FOR BEHAVIORAL RESEARCH IN MENTAL RETARDATION:

A SEMINAR REPORT

Cooperative Research Project No. G-1

R. K. Wilcox, Editor

University of Wisconsin
School of Education
Madison, Wisconsin
1961

The research reported herein was supported through the Cooperative Research Program of the Office of Education, U.S. Department of Health, Education, and Welfare.

ED 003418

TABLE OF CONTENTS

Page

PREFACE iv
SEMINAR ROSTER vii
FOREWORD viii

I

NATURE AND DETERMINANTS OF INTELLIGENCE AND ITS DEVIATIONS

PART A. . . . . A. L. Benton

Introduction 1
Determinants of Intelligence 4
Problems of Observed Changes in Intelligence Level 14
Indications for Research 21
References 26

PART B. . . . . J. F. Jastak

Introduction 28
Intelligence and Personality 34
Relevance of Intelligence and Its Measurement 45
General Strategy and Philosophy 63
References 69

II

PSYCHOLOGICAL DETERMINANTS OF MENTAL RETARDATION . . R. F. Heber

Introduction 70
Current Status 71
Problems of Methodology 78
Research Strategies 83

III

PERSONALITY CONCOMITANTS OF MENTAL RETARDATION . . W. I. Gardner

Introduction 86
Status and Problems 87
Approach to Investigation 93

IV

LEARNING, MOTIVATION AND PERCEPTION . . . . H. W. Stevenson
E. F. Zigler

Introduction 99
Current Promising Research 103
Research Possibilities for the Future 110
Conclusion 114
References 116

V

TREATMENT . . . . H. Goldstein
M. C. Reynolds
Sophia T. Salvin

Introduction 118
Assessment of Current Status of Research 122
Methodological Problems and Proposed Solutions 128
Projected Approaches or Strategies 132
References 139

VI

ADMINISTRATION AND RESEARCH . . . . J. J. Parnicky
H. R. Phelps
R. L. Schiefelbusch

Introduction 140
Career Development 145
Facillitating Collaboration 148
Developing Financial Support 151
Raising and Maintaining Quality 154
Postscript 160
References 162

Preface

This volume is a report of a research seminar on mental retardation which was held at the University of Wisconsin from August 15 to 30, 1961. Sponsored by the Cooperative Research Program of the Office of Education, the invitational seminar brought together 13 leaders in the field of mental retardation to exchange ideas, generate new ideas, and develop guidelines for future research in this field. Dr. Herschel Nisonger, president of the American Association on Mental Deficiency, served as chairman of the seminar.

The purposes of the Cooperative Research Program are (1) to develop new knowledge about major problems in education and (2) to devise new applications of existing knowledge in solving such problems. To fulfill these purposes, the staff of the Cooperative Research Branch works with researchers in colleges and universities and state departments of education, specialists in the Office of Education, and educators generally in carrying out two major aspects of the Program, which provides financial support to colleges and universities and state educational agencies for conducting research, surveys, and demonstrations related to the field of education. Project proposals are accepted for review by the Program's Research Advisory Committee on or before September 1, December 1, and April 1.

The second and relatively new major aspect of the Program consists of seminars, conferences, and individual research development contracts, which are referred to as research development activities. The seminar reported herein is the first in a series which the Cooperative Research Program is planning on various topics related to education. The seminars will bring together for several weeks outstanding individuals who are currently conducting or have recently completed significant research in a given area in order that they might share their experiences in attempting to develop major research designs and guidelines for future research. The conferences, to which 20 to 30 persons will be invited for several days, will provide leaders in an area of specialization with the opportunity to meet for the purpose of stimulating each other to conceive new approaches to selected research problems. The first conference, held in January 1961, dealt with the field of guidance and counseling at the secondary level. Emphasis was given to needed research on counseling procedures, instruments, and the training of counselors. The third research development activity is concerned with individual research development contracts. Individuals who have made major research contributions in their area of specialization will be asked (1) to analyze and synthesize the research which has been done; (2) to examine the strength and weaknesses of the research approaches used; and (3) to suggest new approaches. Hopefully such activities will lead eventually to the development of proposals for projects of greater than usual scope and significance.

The over-all purpose of the research development activities is to increase the quantity of high quality research leading to solutions of major problems in the field of education. As a contribution toward the realization of this goal, the following report of the research seminar on mental retardation is offered as a source of guidelines for future research in this field.

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Research Consultant
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SEMINAR ROSTER

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Foreword

Research is the key to progress in any scientific field of knowledge. Future progress in mental retardation will depend in large measure upon the nature and degree of advances which are made in research. This is true in prevention, diagnosis, medical and therapeutic treatment, education, training, rehabilitation, care, and many other important aspects of the field.

Significant advances in research have been made in mental retardation especially within the last two decades. Among the reasons for these advances are (1) the great upsurge of national interest in mental retardation during this period; (2) the greatly increased funds which have become available for research; and (3) the greatly increased numbers of well-trained researchers devoting their professional efforts to research in this field.

While the total research effort in mental retardation has expanded rapidly, much more attention has been focused upon research in certain areas than in others. For example, until quite recently a relatively large proportion of the total research resources were being devoted to the biochemical, medical, psychiatric and genetic aspects of research. Comparatively little attention was being focused upon the behavioral (psychological, educational and social) aspects of research.

Research progress in the behavioral aspects of mental retardation has been quite slow. It has been criticized for its unimaginativeness, its methodological inadequacies, its lack of conceptual clarity, its lack of integration with the behavioral sciences, and its focus upon certain areas to the neglect of others. More specifically, according to its critics, it has lacked a sense of plan or direction.

The nature and direction of research activities in any given field are influences by many factors, such as (1) the research ideas and interests of the individual researchers; (2) the administrative policies and available research facilities of the institutions operating research programs; (3) the criteria used by funding agencies in evaluating research applications; (4) the availability of qualified personnel; (5) the limitations of research methodology; and (6) the readiness of the public to support various types of research. In the past these factors have operated in large measure independently in the behavioral research aspects of mental retardation and little attempt was made to assess their collective influence upon the nature and direction of research in this field.

In order to provide an opportunity for leaders in the field to explore the research needs in the behavioral aspects of mental retardation, the Cooperative Research Branch of the Office of Education sponsored an invitational seminar at the University of Wisconsin from August 15 to 30, 1961. In this seminar 13 experienced leaders in the field of mental retardation were brought together to evaluate the strengths and weaknesses of research in this field and to develop guidelines for future research. The seminar had the freedom and responsibility for developing its own agenda and work procedures.

Much background material was made available to the participants of the seminar such as (1) a complete list of projects initiated under the Cooperative Research Program; (2) abstracts of research projects in mental retardation from the Science Information Exchange; (3) abstracts and reports of completed projects from the Cooperative Research Program; and (4) assessments of strengths and weaknesses of current research in mental retardation by experienced researchers in the field. In addition, many of the participants brought materials which were shared in the seminar.

The seminar modus operandi was quite flexible. It consisted of (1) discussion by the total group of such matters as seminar procedures, research issues and problems, and reports of individual and small group assignments; and (2) work by individuals and small groups on specific research areas.

To facilitate intensive study by individuals and small groups, the participants divided the research field in mental retardation into the following areas:

1. Nature and Determinants of Intelligence and Its Deviations -- Parts A and B.
2. Psychological Determinants of Mental Retardation.
3. Personality Concomitants of Mental Retardation.
4. Learning, Motivation and Perception.
5. Treatment.
6. Administration of Research.

The following guidelines were set up for the study of each of the above areas:

A. Relevance of the area to mental retardation.

B. Assessment of the current status in the area.

C. Research methodology problems in the area and proposed solutions.

D. Proposed approaches and strategies to research in the area.

This volume contains the final reports prepared by members of the seminar in each of the research areas. Each report was carefully studied and discussed at two stages of its development by the total seminar group. Unanimity of agreement was reached on most of the critical issues treated in the reports.

It was felt that a particular point of view of individual members of the seminar need not remain unexpressed because of the lack of complete agreement. The final reports, therefore, reflect the position of the author(s) and the changes they chose to make as a result of the group discussions.

Throughout the reports particular attention was given to the problems of research design and the formulation of promising research problems. This has been done within the context of the content discussion rather than in abstracts in order to attain maximum illustrative value. Although the discussions are concerned with mental retardation, the mentally retarded were not regarded as a discrete group characterized by behavioral attributes not shared by normal individuals. The ultimate goal is for the findings and constructs in the field to be incorporated into a general theory of human behavior.

The contributions in these reports vary in both approach and style. They express the considered judgments of a number of mature investigators, teachers and administrators in the field of mental retardation. It is believed that, taken as a whole, they fulfill the basic purposes of the seminar and should prove of considerable value to administrators, clinicians, researchers and teachers in this field.

NATURE AND DETERMINANTS OF INTELLIGENCE AND ITS DEVIATIONS: PART A

A. L. Benton

Introduction

One way of viewing intelligence is to think of it as a global concept referring to a number of behavioral abilities which are valued by society because of their actual or presumed relationship to the personal, social, and economic adjustment of the individual. Among the more prominent of these abilities are: communication skills (as assessed by, for example, vocabulary level and the understanding and expression of complex verbal propositions); capacity to learn and to retain; reasoning ability (particularly when it involves the process of abstraction); capacity for perceptual analysis and synthesis; and ability to handle problems of a mathematical nature. Since intellectual subnormality is considered to be the most salient characteristic of mental retardation as a distinctive type of behavioral maladaptation, the concept of intelligence is of central importance in this area.

The controversy as to whether it is more fruitful to conceive of intelligence as a single unitary ability, as the sum of a relatively few primary abilities, or even as the sum of a relatively large number of specific abilities, is of long standing; it continues among theorists to the present day.

However, there is basic agreement that as a matter of empirical fact the several performance measures which make up a typical intelligence tests battery do show substantial positive intercorrelations and hence that it is possible to derive a "general factor" (of a "first" or "second" order, according to one's theoretical biases) from observation of performances on a variety of intellectual tasks. The concept of a general factor finds application in the field of mental retardation because the intellectual subnormality in this condition is assumed to be pervasive in nature and to extend over a wide range of intellectual operations. Thus mental retardation can be viewed as being characterized by a depression in a general factor and distinctions can be drawn between this condition and those (such as developmental aphasia, reading disability or visuoperceptive impairment) which can be viewed as expressions of lack of development of a primary factor or a specific ability.

"Intelligence", as empirically defined by the behavioral measures currently employed to assess it, changes qualitatively as well as quantitatively throughout the developmental period. The "intelligence" of an infant is evaluated largely in terms of postural, motor, and prehensile skills that find no place in the intelligence batteries designed for older school children and adults. The "intelligence" of a preschool child is typically defined in terms of his perceptual acuity, manual dexterity, and ability to express or react appropriately to relatively simple verbal propositions. It is only with the child of school age that test batteries begin to cover the full constellation of abilities which have been mentioned as forming the concept of intelligence.

The relationship between intelligence as assessed in early life and intelligence level at later ages has been the subject of numerous studies, the results of which are well known. Two findings of major importance are:

(1) The correlations between assessments of intelligence level in infancy or early preschool childhood and assessments made in later life are so low as to have minimal predictive significance.

(2) Assessments of intelligence level made at the age of six years or older show correlations of moderately high magnitude with assessments made in later years, the size of correlations varying directly with age at initial test and inversely with the length of the interval between initial test and retest. These correlations are sufficiently high to permit prognostic statements of some validity about the "most probable" future intellectual level of an individual child to be made. However, they are not so high as to exclude the possibility that a child

may show considerable change in level of function over the course of the school years and, in point of fact, every comprehensive study has recorded gains or losses of 15-30 points in individual children over an interval of a number of years.

Determinants of Intelligence

The lack of relationship between assessments of intelligence in infancy or the preschool years and assessments made in later childhood or maturity, as well as the occurrence of significant changes in rate of intellectual development during the school years, leads to a consideration of the determinants of the intelligence level of the individual. It can be stated quite simply that since "intelligence" is a valuistic concept applied to certain aspects of behavior, its determinants are the same as those which operate in behavioral development in general.

These determinants are often classified in three broad categories, namely: (1) physical factors; (2) social and cultural factors; and (3) factors arising out of the specific life experiences of the individual. However, while this classification is useful for analytic purposes, it is appreciated that in reality they often operate in conjunction with each other, either in synergistic fashion or in the form of one type of factor actually being the determinant of another type of factor. For example, a peripheral physical disability in a child of substandard social and economical background may lead to his receiving inadequate education, thereby leading to a retardation of his intellectual development. Conversely, parental neglect as a specific expression of social and educational factors may provide the setting in which an infant is permitted to ingest paint from furniture or toys, this in turn leading to lead poisoning which produces central nervous system damage and defective intelligence. Much of the work of the Pasamanicks illustrates this interplay of social and physical factors in producing behavioral abnormalities, including mental retardation, e.g., poor maternal nutrition, itself a function of substandard economic and educational status, leading to prenatal or paranatal abnormalities which in turn determine subsequent behavioral deficit in the child.

This close interaction of the different types of factors which determine intellectual development often poses methodological difficulties when analysis of the effects of any single type of factor is attempted. The critical experiment designed to evaluate the influence of one or another variable, which is a commonplace in investigation on aminals, is usually not possible to do in man. Hence one must be content with the so-called "experiments of nature" in which unusual conditions or pathological alterations have produced observable effects. However, not having taken courses in scientific method or the philosophy of science, nature does not usually perform the rigorously designed experiments required to answer the questions which are posed.

The physical factors that enter into the determination of intelligence level are usually divided into those of an hereditary type and those of an acquired type. Again, while this distinction is useful for purposes of analysis, it is realized (as modern geneticists have insisted) that the two types of determinants exert their effects only in conjunction with each other. Thus, for example, the genetically determined error of metabolism which is the basis of phenylketonuria produced this pathological condition only in a standard environment that provides phenylanaline in the diet of the affected individual. A single highly specific change in the environment, viz. withholding of phenylanaline from the diet, will prevent the occurrence of the pathological condition.

It is useful to consider specific and general factors separately in considering the influence of hereditary factors on intelligence levels. The existence of a few specific genetic factors which determine clinically distinguishable type of gross subnormality (such as phenylketonuria or amaurotic familial idiocy) is well known. However, these are quite uncommon conditions and the models which they present have very little bearing on the broad question of the hereditary determination of intelligence. No such specific genetic factors have been identified to account for the observed variation over the range of intelligence to be found in the population at large. Nor are they likely to be found since intelligence is admittedly not a simple trait but rather a global evaluation of certain aspects of behavioral efficiency. Therefore, those students of the subject who believe that heredity is an important determinant of the variations in intellectual level which are observed in the population at large have involved a more general concept, namely, that of the multifactorial genetic determination of intelligence. According to this concept, intelligence is the product of a relatively large number of specific genetic factors. Each of these factors (to take a hypothetical example, the number of cells in the cerebral cortex) is normally distributed in the population and individuals differ from each other with respect to the number of "plus" or "minus" values of these factors in their hereditary endowment. A person with a higher-than-average number of "plus" values will be an "intelligent" person, given standard environmental conditions. If he mates with a person who also possesses a higher-than-average number of "plus" values in her hereditary endowment, the chances favor the production of offspring with higher-than-average numbers of "plus" values in their hereditary make-up and hence of intelligence offspring, given standard environmental conditions. The converse will hold true for persons with lower-than-average numbers of "plus" values.

Studies (done for the most part by European investigators) which have been directed toward testing this hypothesis have been essentially of a naturalistic nature, consisting of determinations of familial resemblances in respect to intelligence level. The findings have been positive (i.e., there is substantial resemblance in intelligence among blood relatives) and hence are consonant with the hypothesis of a multifactorial genetic determination. However, given the generally loose character of these extensive studies and, above all, the failure to control the major competitive variable of environment, these findings do not provide strong evidence for the hypothesis. At best they are merely consonant with it and other interpretations are not only possible but equally cogent. American opinion has tended to reject the genetic interpretation, individual reactions varying from a simple lack of acceptance to indignant rejection with ideological and political overtones. The issue remains an open question and should be so considered.

That acquired physical factors (i.e., physical events occurring during the life history of the individual) can affect the development of intelligence is too well known to require documentation. It is noteworthy that, for the most part, these factors affect intelligence by their direct action on the structure and function of the central nervous system. Thus encephalitic infection causes a diminution of all or selected aspects on the tissue of the developing brain. Conversely, administration of thyroxine causes acceleration of rate of intellectual development in the hypothyroid child by its effects on neural conduction and the development of neural tissue. In addition to these agents which act directly on the central nervous system, clinical experience (particularly as reported by Russian observers) suggests that physical factors such as malnutrition or congenital heart disease, which do not have a direct effect on the central nervous system, can also adversely influence rate of intellectual development; the determining factors being undue fatigability and lack of drive or energy.

A finding which is disclosed more clearly by the study of patients with brain damage acquired after the developmental period than in patients with brain damage dating back to the early years of life is that focal cerebral disease can have fairly selective effects on primary abilities. For example, depending primarily on the locus of the lesion, one patient will show specific language deficit (temporo-parietal lesions of the dominant hemisphere), another patient will show specific recent memory deficit (bitemporal lesions) and still another patient will show specific deficit in spatial perception (parieto-occipital lesions, particularly on the non-dominant hemisphere).

Another result which is of possible relevance in assessing the role of acquired brain damage as a determinant of intelligence is that cerebral insult in infant organisms has been shown to have much less serious behavioral effects than comparable insult in mature organisms. Many years ago Kennard reported that excision of the motor area in infant chimpanzees led ultimately to only very slight motor deficit on the opposite side while a similar lesion in mature animals produced quite severe impairment in motor function. More recently it was shown that excision of the somesthetic area in infant cats resulted in only the slightest impairment in tactile discriminative ability while the same excision in mature animals led to gross deficit. The most recent study of this type has involved bilateral removal of frontal cortex in infant monkeys. In mature animals this ablation leads to an easily observable inability to maintain set in the performance of delayed reaction problems. However, animals who had been operated in infancy did not show this behavioral impairment. Clinical experience tends to be in accord with these experimental findings. Removal of an entire cerebral hemisphere in a young child leads to only minimal motor deficit on the opposite side and to no appreciable dropin intelligence.

That social and cultural factors can affect the development of intelligence is also so well known that only illustrative documentation is necessary. The several studies showing typical rises in IQ between the first and fourth years of high school and between the first and fourth years of college testify to the intelligence-enhancing effects of formal education. The findings of a fairly carefully controlled Swedish study of the intelligence at maturity of groups of 10 year old children who had been matched for intelligence point to the same conclusion. At maturity those individuals who had continued in school showed significantly higher intelligence quotients than did those whose schooling had been discontinued, chiefly for economic reasons. The many studies of the intelligence of adopted children suggest that cultural factors other than formal schooling, such as the socio-economic status of the family and the character of the community, are effective determinants of intelligence level, at least to a limited degree. The mean intelligence quotient of adopted children is essentially the same as that of their foster parents' true children. Moreover, while the correlation coefficient between the intelligence quotients of children and true parents is typically lower. Thus the correlations which are obtained between the intelligence quotients of children and true parents living together appears to reflect the cultural status of the home created by the parents as well as the influence of genetic factors.

The influence of interpersonal events in the life history of the individual that are a product of his specific experience (as contrasted to the experience which he shared with other members of his subcultural group) in intelligence level is problematical. On the basis of intensive therapeutic experience with individual children, many therapists are convinced that neurotic illness can adversely affect the intelligence level of a child to a significant degree. Moreover, it is easy to conceive how the intense personal preoccupation and the self-defeating behaviors engendered by intrapsychic conflict could retard acquisition (both in and out of school), of the cognitive skills which define intelligence. Finally, an impressive amount of information both from the psychological laboratory and from everyday experience testifies to the deleterious effects of anxiety, hostility and attention to distracting events on efficiency of intellectual performances. Thus the idea that neurotic illness in the developing child can affect the growth of intelligence and its status at maturity seems eminently reasonable. Yet, as with the question of the validity of the multifactorial concept of the genetics of intelligence, good evidence for the proposition is lacking. Systematic studies of the effects on the IQ of psychotherapeutic intervention in the cases of these disturbed children (with presumably at least some ameltioration of the emotional disorder) have yielded quite unimpressive results. When practice effects in test-taking are discounted, a net gain of only a few points is reported. Nor is there evidence that healthy and neurotic children of the same social class show significant differences in intelligence level.

Problems of Observed Changes in Intelligence Level

The problems posed by observed changes in level of intelligence through the developmental years can now be considered in the light of this sketchy discussion of our present knowledge of the determinants of intellectual development. In all probability one reason for these changes is that conventional assessment procedures in the early years do not adequately sample those behaviors which are the precursors of the abilities which are evaluated in later life. Another factor which no doubt contributes to the magnitude of these "change" scores is the unreliability of the single conventional measure which is accepted as representative of level of intellectual function at a given age. This holds particularly for assessments made in infancy and early preschool childhood. Factors such as these being excepted, the generalization may be advanced that "true" change in intellectual level in the course of the developmental period is a function of corresponding change in the physical, social and individual experiential factors which determine that level. Thus a positive or negative change in physical status with its effects on energy level, school attendance and play experience or a transfer from a very poor school to a very good one (or vice versa) may be expected to have an appreciable effect on rate of mental growth over the course of years. If these determinants operate in conventional or expected fashion, rate of mental growth should also proceed according to expectations. The "constancy of the IQ" is thus a resultant of "constancy" in the determining factors. Direct empirical evidence in support of this generalization is still rather meager. However, such retrospective studies as have been done which have sought to relate changes in relative level with incidents in the life history of the child have yielded some positive findings.

Mental retardation represents one tail of the distribution of intelligence in the population. The degree to which the foregoing observations on the nature and determinants of intelligence in general apply to the clinical problem of mental retardation may now be considered.

It has already been mentioned that a general factor is derivable from the matrix of positive intercorrelations among the scores on the tests forming an intelligence battery (including batteries expressly designed to assess primary abilities, such as those of Thurstone) and it has been suggested that subnormality of this general factor constitutes a reasonable definition of mental retardation. The question of whether this general factor is of a first-order nature (i.e., represents the influence of the variance of the individual factors on the variance of each other) remains open. If the latter conceptualization is accepted, the question arises as to whether severe impairment of a primary factor such as the verbal or memory factor cannot be a sufficient determinant of the global intellectual deficit which is characteristic of mental retardation. It has been pointed out that selective behavioral impairment is found in brain-damaged adults but only uncommonly in brain-damaged children. A possible reason for this is that the well-established intellectual skills of of the adult are affected only slightly by lesions which do not interfere with their direct neural substrate while in the child the acquisition of all intellectual skills depends upon the integrity of each of them. It follows that there may be states of mental retardation which represent the global effects of severe impairment in a single primary ability. Verbal ability may be taken as an example. While congenital aphasia as a clinical condition which is discriminable from mental retardation exists, it is also possible that verbal disability of sufficiently severe degree could itself be a major determinant of an observed global retardation. Many child psychologists have insisted upon the indispensable role of language in the ongoing process of general mental growth in the child. For example, Luria and Yudovich assert that language habits regulate behavior, stabilize perception, make possible abstract reasoning and the apprehension of complex relations, and raise the level of the child's thinking "to a higher, qualitatively new stage." If this is so, it is only to be expected that a child with severe language handicap will suffer from retardation in the development of virtually all intellectual skills. The same may be true of the global effects of specific memory impairment. In this connection, it is of interest that comparative studies of the patterns of performances of mental retardates and normal children of the same mental ages have rather consistently shown that the retardates are inferior in immediate memory tasks.

Summary

Among the possible determinants of intelligence level in general which have been discussed, special genetic factors are most securely established as a causative agent in mental retardation. However, the proportion of cases which can be accounted for on this basis is extremely small. It is possible that continued genetic and biochemical investigation will disclose specific genetically transmitted metabolic deficits as the basis of additional cases. However, there are no strong indications at present that such genetic mechanisms will be found to be operative in the majority of the retarded population.

Another possibility is that high grade retardation is genetically determined on a multifactorial basis, the retardate and his ancestors carrying a less-than-average number of "plus" values in their genetic endowments. This constitutes the traditional theory of simply high grade defect which is still held by many workers but which has come under sharp attack in the last two decades. As has been pointed out, the evidence for this proposition is quite slim. However, it should be pointed out that the concept is by no means in contradiction to clinical or investigative experience. It simply suffers from evidential anemia.

Acquired physical damage is often the demonstrable cause of mental retardation. However, cases of unequivocally established exogenous origin account for only a relatively small proportion of the total number of retardates. The danger of erroneous diagnostic inference in this area must be emphasized. Not all cases of retardation of the brain-damaged type necessarily have a purely exogenous etiology. There is the distinct possibility that the brain damage may result from an interaction of genetic deficit with normal or abnormal environmental stress. The experimental and clinical findings on the minimal effects of purely exogenous cerebral damage in infants, animal and human, suggest that this possibility must be kept in mind.

As has been pointed out, social and cultural factors do play an appreciable role in determining level of intelligence. However, that these effects are sufficiently extreme to produce the major depression of intelligence level which is characteristic of mental retardation has not been demonstrated. The current climate of professional opinion in this country, at least among behavioral scientists, favors this possibility. The evidential basis for it is as anemic as that for the multifactorial, non-specific genetic theory of high grade retardation.

The proposition that severe emotional disturbance of psychogenic origin in children can take such a form as to lead to a significant inhibition in the development of intellect and produce a state of mental retardation has been advanced by a number of clinicials. Evidence for the hypothesis is provided by the results in a few intensively treated cases which are usually designated as examples of "pseudofeeblemindedness." Critical analysis of the relevant literature leads to the conclusion that the idea is a tenable one but still lacking empirical support.

Longitudinal studies of course and outcome in mental retardation may be compared with the more general longitudinal studies of intelligence level in the population as a whole which have been mentioned. There has been little work on the prognostic significance of intelligence assessments made in infancy or early preschool childhood. One reason for this is that relatively few cases of high grade retardation are identified in the first two or three years of life. Another reason is that, in contrast to the more general studies which were purely observational in nature, the discovery of a case of retardation in the early years leads to efforts for corrective action, e.g., a cretinous child is treated with thyroxine, surgery may be undertaken to relieve intracranial pressure in a case of hydrocephalus, etc. These considerations reveal the rather sterile nature of studies concerned *merely* with the prediction of future intellectual status in retardates, since these studies are based on the unjustifiable assumption that prediction reflects a destiny that is independent of the effects of future events. But intelligence level in mental retardates is a variable which is determined by a number of factors, at least some of which can be modified by deliberate biochemical, surgical, educational, psychotherapeutic or social intervention. From this standpoint, there is little hope of being able to achieve greater precision in the prediction of terminal level of intelligence without considering the influence of these factors.

Indications for Research

The foregoing review has indicated that there is a serious dearth of firm knowledge about the determinants of the low intelligence level which defines the clinical category of mental retardation. The specific genetic character of a few rarely occurring conditions has been established and cases that are clearly the resultant of exogenous brain damage have been identified. However, the nature of the determinants in the majority of cases remains unknown and no decisive evidence has been adduced to implicate other genetic factors, social and cultural influences, or effects of the specific life experience of the individual.

Investigators have addressed themselves to each of these questions. Why have their studies failed to provide satisfactory answers? The reason is perhaps to be found in the several types of inadequacy in research design which characterize these studies as a group, some studies showing one type of inadequacy, others showing another type, etc. Some of the defects which come to mind are:

(1) Inadequate control of relevant variables which are not the focus of interest. This fault seems particularly evident in the extensive retrospective studies of the genetics of mental retardation in which environmental factors are left essentially uncontrolled.

(2) Inadequate measures for identifying individuals for placement in diagnostic categories. In many studies, a single test (sometimes of the group paper-and-pencil type) has been used to establish the level of intelligence of the subjects. Such cursory assessment would seem to be a particularly potent source of error in dealing with infants and young preschool children in whom single assessments, even by the most experienced examiners, are notoriously unreliable. When brief paper-and-pencil tests are given to uneducated subjects (as in many genetic studies), the results are likely to be biased in favor of the genetic hypothesis. When selection of retarded infants or preschool children is based on the results of a single test, the effects of the "treatment" may sometimes reflect merely a regression to the mean phenomenon.

(3) Inadequate operational definition of the factor under investigation. One has in mind here definition of "enrichment of the social and cultural environment " in terms of 10 hours per week attendance in a preschool or membership in a

special class with an "enriched" curriculum. Under these circumstances, negative results hardly provide evidence of the unimportance of social and cultural factors in determining the intelligence level of retardates and positive results are equally suspect.

(4) Lack of adequate control groups. The exigencies of investigative work in this area often make it impossible to form a truly comparable control group or to evaluate it as intensively as the experimental group.

(5) Preoccupation with the effects of a single factor. The possibility that mental retardation may be the product of interactions among diverse factors is not included for evaluation in the research design (usually because conditions do not permit such a complex design.)

The overcoming of these inadequacies in research in mental retardation implies designs of much larger scope than have heretofore been attempted. In the last decade there have been carried out a number of major investigations, the scope of which has been conspicuously larger than that of previous studies. The project of Samuel Kirk at the University of Illinois, in which the effects of preschool attendance on the intelligence level of retardates were evaluated, is one example of such a study. It would seem that studies of even wider scope and permitting both stricter control of conditions and decidedly more intensive experimental treatments are required to answer the major questions about the determinants of intelligence level in mental retardation.

One thinks not in terms of a project of conventionally large size by current standards but rather of the establishment of two or three colonies as research institutes, each with a population of about perhaps 2500 subjects. The operation of these institutes would be devoted entirely to the investigation of the effects of the several possible determinants of intelligence level. The major studies pursued in these centers would be prospective, permitting as precise a control of conditions as possible, and not retrospective in nature. By definition these studies would cover a span of at least 10 years. Subjects would be drawn from the entire country with precise selection in accord with hypotheses to be tested. If conditions permit, studies need not be restricted to identified retardates but also attack problems associated with the determinants of intelligence level in general.

Examples of studies which might be undertaken are: (1) Formation of groups of infants, who under ordinary circumstances would be placed for adoption or institutionalized, of "good" and "poor" hereditary endowment, as defined by professional geneticists and those workers in the field who favor a multifactorial genetic theory of high grade retardation. Identical treatment through the years with assessment at later ages.

(2) Identification of mental retardates in the earliest years of life with collection of genetic, medical and psychological information. Investigation of the main effects of relatively poor institutional care vs. relatively good institutional care vs. high-level family care and of the relationship of these effects to the intially collected information.

(3) Evaluation of the effects of long-term intensive psychotherapy in a maximally therapeutic general environment on the development of a group of children diagnosed as mentally retarded by reason of emotional disturbance combined with observations of the development of a group of similar children in a more ordinary environment.

(4) Exploration of new methods for the training of physically impaired children in whom it is possible that a global mental retardation is being determined by the handicapping influences of the defect. Partial behavioral disability (e.g., developmental aphasia, marked memory deficit) might well be included for study.

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NATURE AND DETERMINANTS OF INTELLIGENCE AND ITS DEVIATIONS: PART B

J. F. Jastak

Introduction

The plan to be developed in this presentation had its origin more than thirty years ago when psychological observations in lifelike settings, with practical implications, seemed to contradict the teachings of educational and clincal psychology of the time. Studies of people indicated that answers to the simplest questions, whether in response to test or conversation, expressed a number of qualities differing in time, place, contents, form, cause, effect, and total combination of motives. It was difficult to see how such answers could be added to represent meaningful adjustments.

A man of inferior schooling once defined the word "scorch" as the "partial oxidation of cellulose." The same man could not explain what makes a sailboat move. An honor student in college gained an almost perfect score on an experimental information test covering a wide range of knowledge. He knew much about Shakespeare and Schopenhauer. When asked to give three reasons why there are windows in houses, he said: "First, to put flower pots on the window sills. Second, to put Venetian blinds on the windows. Third, to protect our constitutional rights." It seemed fair to leave the evidence of superior knowledge and inferior common sense of these two men just as they occurred, untotaled and unaveraged.

When the same questions were put to juvenile delinquents, the observed levels of competency were somehow reversed. Most chronic delinquents of those days never heard of the word "scorch", knew next to nothing about Shakespeare and Schopenhauer, and had no more general knowledge than mentally retarded persons display. However, they usually did know what makes a sailboat move and why there are windows in houses. Comprehension questions of this type showed the delinquents to be relatively adequate in social alertness, practical acumen, behavior flexibility, and understanding of the motives, attitudes, conventions, and intentions of other people. Despite low levels of literacy, they frequently excelled high academic achievers in the comprehension of simple life situations. Again it seemed fair to leave the evidence as it was, without adding and averaging.

Being well-informed and being socially wise are two of several traits measured by tests. Even a lay observer may conclude that the college student, though defective in social comprehension, is probably not mentally retarded. It should also be clear that the delinquent, though illiterate, is not mentally retarded. Yet the delinquent has a greater chance of being considered mentally retarded. Why? Because society and mental examiners think more highly of a person who is literate than of one who is socially perceptive. They conveniently look at only one side of the coin as if they wished not to see the rest. Social shrewdness at the expense of knowledge represents the other side of the same coin. Is the other side preferable? Not necessarily. Some people concentrate on the social side of the coin and try to convince everyone else that their side is the legitimate one. They do not see that exclusive emphasis on social adjustment may be as deviant and irrational as is the overemphasis of the knowledge side of it. The coin of social values has more than two sides. Hence the chances of being one-sided are many.

The preceding discussion may be summarized in the following points:

1. Such terms as intelligence, cognition, perception, and motivation are often deductively imposed on behavior operations rather than inductively derived from them as a consequence of research. Defining words, solving number problems, and putting puzzles together may or may not be intelligent, cognitive, perceptual, and motivational behavior. But many have assumed and continue to assume that tests of these behavior operations are intelligence tests, or cognition tests, or perception tests, or motivation tests, or tests of whatever you wish. If a behavior sample can be interpreted by different investigators as being a valid measure of different traits, it is possible that each investigator sees only that fraction of the truth most congenial to his personal needs. It is also possible that all the fractions of truths may characterize each behavior sample.

2. The values and peculiarities of society and its various outcroppings stigmatize the interpretations of psychological

and social research. To these biases, as was already noted, must be added the prejudices of investigators who unwittingly build, accept, and support theories that are better suited to their personal defenses than to conditions existing in the rest of humanity.

3. In social science research it should be more important to be broadminded and objective than to be progressive, dynamic, functional, modern, non-directive, child-centered, or otherwise inclined to substitute new superstitions for the old ones.

In the light of the above arguments, objective research in behavioral science should address itself to five fundamental questions:

A. How broadly and effectively does the goal of a specific project satisfy the necessity of understanding and improving man and society as a whole?

B. What behavior operations are relevant to that specific research goal?

C. How well are the behavior operations differentiated from the independent and interpretive determinants underlying them?

D. How much of each interpretive determinant enters into the behavior samples under observation?

E. How much of each interpretive determinant is needed to change and ameliorate behavior?

In current research the first question is often viewed in narrow perspective. Banality of goal is sometimes preferred.

The second question receives most of the attention at the expense of all else. The third question is usually "solved" by misidentifying crude operations with the distinguishing variables looked for. The fourth and fifth questions are mostly of little concern. They may be vaguely implied but do not find the unambiguous expression and the unqualified support that is needed to make social science research count.

Despite all these frustrations social scientists work prodigiously to discover the attributes of a normal or even perfect human being, and along with them, the attributes of a normal or even perfect society. Perfect men in perfect societies will not be Utopian creations. They will still be subject to intolerable crises and golden eras. Labor and leisure will continue to be their lot. But they may be better equipped to conquer adversity in times of stress and to resist mental and physical decline in times of good fortune.

To achieve these lofty goals, society will have to counterbalance the strong emphasis on the natural sciences with an equally strong emphasis on the social sciences. Furthermore, research workers and advisory committees on research will have to learn to appreciate the differences between goal and gambit, between purpose and propaganda, between operation and interpretation, between variable and variance, between meaning and method, between logic and tool, between cause and effect, and above all between self-indulgence and self-actualization.

The program which follows is offered as a modest example of research in mental retardation designed to be relatively free from the usual difficulties of that field. Most of the ideas developed in the plan have been pretested in many ways, on many population samplings, and in small and large scale research.

Intelligence and Personality

It is assumed that intelligence is a limited component within the total functional resources of the organism. If these total resources are regarded as the personality of an individual, then intelligence is a part function of the personality. Personality research belongs to a number of contiguous disciplines. Biochemistry, physiology, psychology, sociology, anthropology, speech pathology, and education have a part in the study and clarification of human behavior at various levels of complexity and generality. Complete knowledge of human personality will not be attained until the many fragments of information from these disciplines are brought together and properly re-interpreted in new and challenging ways.

The statements of the following paragraphs are intended to represent a circumscribed area within the broad gamut of science hierarchies. Specifically, the viewpoints and methods are those of the field of psychology. Though the scope of interest under discussion is admittedly narrowed down, it is nevertheless highly complex and broad enough to transcend the capabilities of most research workers in a single domain. The ideas and problems to be touched upon will have the usual gaps, biases, and inadequacies typical of the productions of a single investigator. Personality research as a psychological endeavor has its own objectives, assumptions, methods, and practices. Psychological criteria alone are not adequate to the task of explaining all that is to be known about personality. Brief excursions into adjoining fields may occasionally be necessary.

Nature of Intelligence

Intelligence may be formally defined as a general factor which influences all phases of behavior to some extent. As such it can be conceptually abstracted from any human activity, providing the activity is systematically observed, scaled, classified, analyzed and interpreted. It is desirable that the observations, scalings, and interpretations, be expressed in precise and easily identifiable terms, verbal and arithmetical.

Several other characteristics of intelligence may be mentioned to elucidate its general nature as here conceived. Intelligence may be thought of as determining a relatively small portion of the total variance of behavior. It is general because it is present in nearly all behavior samples. Its effect is partial or incomplete in nearly all behavior samples. To put it in another way, a behavior sample is the function of intelligence plus numerous non-general or non-intellectual variables, intrinsic and environmental.

Since intelligence contributes only a partial and often minor variance to the total consummation of a behavior sample, it may not be identified with any ability or adjustment no matter how much society or its scientific representatives value this ability at any one time or in any one place. This does not mean that selective emphasis on certain behavior samples preclude the accurate determination of intelligence. Biased and temporary valuations of abilities or of modes of behavior constitute one of the major causes of social disorganization and group ineffectiveness.

Prejudicial values concerning abilities are worthy objects of study but they should not predetermine the scientific nature of intelligence. If they are allowed to do so, sizeable segments of a population sampling are likely to be classified as intelligence when they are not and other sizeable segments of the same population are likely to be classified as unintelligent when they are not either.

Intelligence is probably a capacity level with a variable degree of latency. The degree of latency varies with individuals and cultures. It is a level potential related to optimum personality integration. Optimum integration is attained when most behavior samples of an individual occur within a reasonably close distance from capacity level. The attainment of an optimum level of integration by an individual or a group is dependent on their need systems which in turn devolve on the geophysical and cultural conditions of their existence.

Another feature of intelligence is its ethical neutrality. If the goal of a society is the destruction of certain values, the rate and thoroughness of the destructive behavior activated by such a goal will be proportionate to the intellectual variance in the behavior of the group. The more intelligent the individuals in the group, the more they will destroy. Also, the more intelligent an irrational person is, the more intelligently irrational he is likely to be. These remarks should not be construed as minimizing the value of social ethics. They merely emphasize the idea that scientific definitions of intelligence should include positive as well as negative ethical behavior. Negative ethical goals may not be desirable but undesirability alone does not prevent them from occurring. Intelligence is simultaneously the capacity for creativeness and destructiveness, for prudence and folly. Recognition of the dual polarity of intelligence is crucial, though it must be remembered that its effect on either direction is relatively small and that non-intellectual components of the personality and of the environment often supersede its influence.

Determinants of Intelligence

Intelligence as a capacitive factor may be composed of several pervasive and penetrating background variables. Any such variables should satisfy the characteristics discussed in the preceding section. A variable that does not satisfy the criterion of generality is to be considered non-intellectual. Four background variables will be listed below. There may be others, unknown at present. Each of the four determinants, alone or in combination, may affect the level of intelligence in a quantitatively similar or even identical fashion. Their qualitative differences are stressed to stimulate research and to point out that therapeutic and educational programs might be adapted to the requirements established by differential observation and measurement.

The four properties assumed to be basic to intelligence are as follows:

1. The potential number of receptive and expressive behavior combinations available to the individual in all areas of functioning.
2. The generalized facilitation and inhibition of the use of potentially available behavior combinations associated with cerebral dysrhythmias.
3. The generalized influence of several non-intellectual behavior clusters which in their aggregate effect raise or reduce the overall level of functional competency in relation to the ideal level of integration.
4. The generalized effect of environmental opportunities to exercise the potentially available behavior combinations. Varying levels of need satisfaction, biased social values, and developmental specialization may enhance or hinder the effective use of capacity.

Development of Intelligence and Its Deviations

Outcomes of studies of the development of intelligence depend on the theoretical framework of the investigator, on the tools used in such research, and on the population samplings investigated. Personality and its dimension - intelligence - are in a state of constant flux. The reasons for changes in intelligence are many. They may be summarized in two broad categories: A. The natural unfolding of behavior combinations due to growth and maturation, and B. Health, nutrition, learning and many environmental factors which may produce temporary or permanent changes in the direction and rate of development.

Personality changes have some measure of consistency, orderlines, and predictability. Sometimes this feature of lawfulness is called constancy. Constancy should not be confused with fixity or immutability. Unmodifiability is frequently imputed to genetic factors of behavior. Once geneticists fully understand the processes and structures of inheritance, they will be able to change them. Nothing in human nature is immutable. In that sense, all features of behavior are acquired, some before birth, some after birth. Yet, the acquisition of behavior combinations is not a fortuitous or chaotic process. If it were, this conference would not have been called, because there would be no science of behavior, and along with it, no study of mental retardation.

Wherever there is measurable consistency, there must be structure. Structure has usually a formal unity in space and continuity in time. As a Frenchman once put it in another context: 'The more it changes, the more it is the same.'

Development Due to Growth and Maturation

If the concept of intelligence here developed is accepted as a basis for the following discussion, then it can be confidently predicted that relatively little is known about the development of intelligence with age. As few definitions and procedures in the field of intelligence can lay claim to scientific accuracy, knowledge of the developmental design of maturing intelligence is meager indeed. This circumstance may be a fortunate one for the coming generation of scientific workers. It surely provides great opportunities for pioneering.

Partial insights into the growth characteristics of intelligence may be gained from studies on the development of special abilities such as vocabulary, motor skill, social maturity, and the various school subjects. When several of these abilities are combined and their increments with age recorded graphically, a fairly representative curve of group trends may be obtained. The oft-quoted mental age curve is an example of trend stability. Several weaknesses are inherent in averaged curves. They are:

1. The abilities used in studying intellectual development have different zero points and different developmental ranges. Vocabulary increases may be studied from age one up. Reading development may be observed from age six upward with a possible slight extension downward by the inclusion of related background skills. Some abilities and adjustments can be traced only through small portions of the total growth process.

2. In agreement with the logic of this presentation, vocabulary, reading, motor skill, and school achievements are valid media of intelligence measurement. However, intelligence measures must not be identified with measures of these abilities. If a meaningful dissection of the averaged growth scores of each ability could be made, perhaps one of the sections would represent intelligence. The intellectual variance within each ability is probably different. The growth curve of intelligence might deviate considerably from that of the

averaged ability scores. Stability of psychological measures is mainly a chance phenomenon, resulting from the equalizing impacts of a large number of randomly distributed and independent variables. The growth curve of each variable may be quite different from the growth curve of a combination of variables. This is true of growth curves of special physical characteristics. It may be equally true of behavior dimensions.

3. Intelligence as a thoeretical concept may be a unitary trait but even the best measures of pure intelligence are not unitary. They do not reflect the kind of homogeneity that is ideally anticipated or projected. If intelligence is a composite of four or more factors, then each one of them may show unique developmental features. In fact, these unique features may permit their correct differential identification. Their uniqueness may be particularlystriking at the lower end of the intellectual continuum representing mental retardation.

4. The comparative usefulness of developmental studies of intelligence of special abilities is small, unless representative samplings of each age population are included in such studies. The structural dimensions of behavior will not be fully understood unless the principle of optimum heterogeneity of population samplings is observed. Learning experiments and action research are not necessarily bound by this restriction. Ignoring it in dimensional research leads to some of the most startling conclusions. An example of such

a conclusion is the theory that intelligence as a general factor disappears after the age of 18.

Development of Intelligence due to Non-Maturational Factors

Personality and its components appear to have an inherent design regulating the rates and variations of their development. Each individual has a design typical of himself. This original design may be altered at any point of growth by one or more factors during the life cycle of the individual. The changes may be favorable or unfavorable in the utilization of original capacity resources. The unfavorable changes may eventuate in conditions which simulate, or are identical with, mental retardation.

Nutrition is a vital factor enhancing or deterring effective intelligence by comparison with optimum integration levels. Other important agents and factors are drugs, infections, cerebral injuries, metabolic states, glandular conditions, chronic anxieties, contacts with reality, motivational resources, and educational opportunities. That these factors alter the direction and rate of intellectual development is well known from repeat cross-sectional examinations. What may be the exact course and degree of longitudinal changes is less well known. The selective effect of such changes on learning and other behavior samples is in need of systematic investigation.

Three of the four background variables listed in the section on determinants deal primarily with general conditions blocking capacity realization. The time of incidence of this blocking may be prenatal or postnatal. It may show varying degrees from mild to very severe. Its developmental effects may be erratic or uniform. In each case, the effect on all behavior samples is pervasive in proportion to the variance inherent in them. The three background variables (2 to 4) are probably associated with most of the noticeable deviations from the original maturational design.

The most common manifestations of changes in rates of growth are:

1. Positive or negative acceleration in the development of most behavior samples through the usual growth cycle from inception to age 24 or during short periods at any stage of the cycle.
2. Absolute increases or declines in the development of all behavior by comparison with previously observed rates. Absolute declines may be relatively frequent, though not recognized, occurrences and nearly always eventuate in severe mental retardation.

The two types of deviations in growth are related to concepts of re-integration if the direction of change is positive and disintegration or deterioration if the direction is negative. Phenomena of reintegration are much more common than is supposed especially within the age range between 15 and 30 years.

The two types of developmental changes are also applicable to circumscribed but socially valued clusters of behavior. These deviations should not ordinarily be identified with mental retardation. However, if the changes occur simultaneously in more than one cluster and if the involved clusters are fairly broad and socially significant, a general condition resembling mental retardation may be considered to exist. The possibility and probability of repair and re-integration in such cases is relatively good.

Speech and language impairments, motivational deficits and aberrations, and motor incoordinations present in the same individual at the same time may simulate general retardation in varying degrees. The majority of such individuals turn out to be non-retarded in adulthood. Their early growth may be slow, often negatively accelerated. It seems to stop at the age of 13 or 14 but in reality may continue for many years beyond the time at which it is "supposed" to stop.

Puberty and Intelligence

Students of human development report characteristic displacements in rates of growth during periods of puberty. Sex differences in the development of special abilities are reported to occur with reasonable degrees of consistency. Puberal changes are said to consist of sudden spurts of growth in the positive direction and later of relatively rapid changes in the negative direction when compared with the overall growth cycle. Girls show these growth irregularities at the average age of 12, boys at the average age of 14. Whether the same rates of change would hold if the abstraction of intelligence (from abilities) were matched with abstracted measures (from abilities) cannot be safely predicted. It should be investigated as soon as appropriate measures of intelligence become available.

Old Age and Decline in Intelligence

Whatever happens to integration levels in old age is not well known. It is known that some special abilities tend to decline more or less rapidly after the age of 45. Whether decline in intelligence would parallel the decline in the investigated abilities is quite uncertain. Once the accurate measurement of intelligence is possible, its changes in old age will yield to measurement. The guess is offered that no appreciable changes in general level of intelligence will be found to occur as a result of old age. Negative changes in the efficient utilization of capacity are scientifically observable. However, they are not changes in potential. They rarely satisfy the criterion of a general factor. Present nutritional, medical, and pharmaceutic efforts in the prevention of degenerative changes in aging are likely to reverse, postpone, and diminish the incidence of efficiency loss in old age. Psychological research in cooperation with medical studies in this area would be highly illuminating. They could be carried out on groups of mentally retarded persons if corrections for restricted range of talent are made.

Relevance of Intelligence and Its Measurement to the Field of Mental Retardation

A number of implications of intelligence theory for mental retardation were mentioned in the preceding paragraphs. In the following, its relevance will be further elaborated. The concept of intelligence here proposed is basic to the derivation of scientific criteria of mental retardation. If and when practical measures compatible with this concept are evolved, the area of mental retardation will coincide with a narrow range within the total continuum of such measures. The upper limit of the retardation range may be set at an arbitrary point some distance below the central tendency. From this point on, measures of diminishing magnitude down to a zero point may represent the range of mental retardation. This method of demarcating mental retardation is quite similar to present statistical practices. The main differences and improvements would be in (a) the more abstract definition of intelligence, (b) the use of more discriminating measures of intelligence, (c) the qualitative subdivision of intelligence into several general factors, and (d) the employment of multiple criteria for the practical classification of the mentally retarded. The idea underlying all these points is that accurate measures of intelligence should represent a general adjustment level. The general adjustment level should perhaps be conceived of as a relationship between a potential level to be extrapolated from ability measures and an effective or functional level to be interpolated from ability measures. At any rate, a mentally retarded person is one who shows less than average standing in all or nearly all abilities, adjustments, and achievements.

2

Criterion of Limited Impairment

Impairments of limited scope are not to be regarded as signs of mental retardation even if they should occur in socially valued behavior and in severe degree. The inadmissibility of the criterion of limited impairment in mental retardation becomes clear when it is recognized that "no one is perfect". Serious and unexpected deficits of special adjustment occur in all humans even the most endowed ones. Since man is not perfect, he cannot build a perfect society. An imperfect society sets up imperfect values. Yesterday it may have stressed the capacity for contemplation. Today it stresses the capacity for self-expression. Tomorrow it may stress the capacity for manual ingenuity. If scaled measures were used for the assessment of such capacities, a large fraction of the total population would in each case be considered mentally retarded regardless of whether they were so or not. The measures of each capacity would classify a different fraction of the total group as mentally retarded. Soon, nearly the whole population would qualify for the distinction. Should the idea of limited impairment be logically extended to existing deficits within all personalities, one third of the population would have to be sent to jail as criminal, one third to a mental hospital as insane, and one third to a training school as mentally retarded. Even then, this scheme presupposes a more sophisticated degree of classification than is now used in the area of mental retardation. The fortunate or unfortunate scientists who would adopt this overflexible approach, would have to assign each other to one of the three groups of deviants. They would have one chance out of three of being mentally retarded.

The above argument is less exaggereated than it sounds. Present procedures in establishing levels of mental retardation are so flexible and muddled that persons of all levels of intelligence may be found in special classes and in training schools for the mentally retarded. The criterion of limited impairment is partly responsible for the crudity and laxness in the determination of who is and who is not mentally retarded.

Severe speech impairments and attendant defects in the communication skills may be used here as an example of an area of limited impairment. It goes without saying that defective intelligence is likely to result in defective language skills. The opposite however is not true. At least four out of five persons with defective communication skills are not mentally retarded. Some of them may indeed be brilliant and even creative.

The criterion of limited impairment is equally ineffectual in the study of such limited clusters and operations as motivation, perception, bodily coordination, reasoning and cognition, memory learning, and others. Any one of these valuable traits may be seriously impaired in persons of "good" intelligence. The futility of the criterion of limited impairment will become apparent when the sorely needed measures for the differentiation between general and non-general factors are available. What a lode for research!

Multiple Criteria of Mental Retardation

The explanations of the nature of intelligence given above were intended to be rigorous. Accurate measures of the four background variables determining intelligence level would probably separate the retarded from the non-retarded once arbitrary cutoff points are agreed upon. Despite this, it is essential that the criteria of mental retardation be several rather than just one. Multiple criteria may be derived from psychometric tests, educational growth, vocational status, social maturity, and others. When several different areas of adjustment are used for the extraction of intelligence measures, the cutoff points for each criterion may be relatively liberal. If criterion measures from the fields of medicine, physiology, and sociology could be added to those of psychology, the act of defining the field of mental retardation would become unusually precise and accurate. Multiple criteria from valid disciplines are self-correcting. In such a system, it would soon become evident that some persons with intelligence quotients of 60 (M=100, S.D.=15) are not mentally retarded and that some persons with intelligence quotients of 85 are retarded. The overwhelming majority of investigators carrying on research in mental retardation could not satisfactorily answer the elementary question: "How do you know that the people you are studying are mentally retarded?"

With present methods, if they deserve that nomenclature, an arbitrary cutoff point in I.Q.'s makes for a large margin of error on both sides of the point. Proper methods of scaling and interpreting would have to be developed whether the non-psychometric criterion belongs to the field of psychology, medicine, sociology or others. Research unlimited!

Methods and Instruments of Assessing Intelligence

There are perhaps three distinct psychological methods of assessing intelligence. They are:

1. Controlled tests, objective and projective.
2. Learning experiments.
3. Observations of spontaneous behavior.

Controlled Tests, Objective and Projective

It cannot be repeated too often that intelligence and so-called intelligence tests are two entirely different things. Intelligence may be abstracted from ability tests and their measures. It is not one with them. The name "intelligence tests" should be abandoned as promptly as possible. The very same tests could be called "sanity tests", "motivational tests", "learning tests", "perceptual tests" with equal degrees of accuracy and inaccuracy. To some extent, they measure all these things and more. The term "psychometric" seems preferable. It assumes less and explains more, at least potentially. While these remarks deal primarily with semantic matters, it is felt that clarifying such matters improves communication between research workers and stimulates creative thinking.

Theories and the words in which they are couched tend to be more fertile in the long run if they adhere to the principle of parsimony of assumptions. Binet, the acknowledged initiator of controlled tests, provides educators and psychologists with a most practical tool. His theory of that tool is being gradually displaced as inadequate. Rorschach, on the other hand, provides mental examiners with a tool of inherently limited value. His theory of that tool is likely to survive for a long time. Those who use tests should perhaps be advised to agree with Rorschach that any test, whether objective or projective, is a test of the whole thing. Agreement with Rorschach on this point does not imply that the ink-blot pictures, in and of themselves, afford valid or even convenient measures of personality. It might be expedient to combine both types of tests in research studies, to apply their respective methods reciprocally so as to find out what they really measure and how much of it they do. After all, the Rorschach, the Van Lennep, and the Thematic Apperception tests are no different from any psychometric test of a partly pictorial and partly verbal nature. If lengthy protocols were obtained from such objectives tests as picture completion, picture arrangement, social concept, picture reasoning, picture anomalies, and others, they would provide similar information to that of the so-called projective tests. The latter give different information now, because they are used differently and not because they are basically different tools. Both the objective and projective values of all these tools are limited in scientific investigations of intelligence. This argument seems to limit the potential usefulness of the projective tests and enlarge that of the objective tests. Which of the two procedures is preferable? The contribution of the two techniques depends on the investigator's aims and on his personality defenses. If his main emphasis is on contents of experience and on giving free rein to his own subjective projections, he will prefer the protocol technique. If however his main interest is in the formal structure of the personality, he may have to resort to the scaled score system of the objective tests. Both techniques are thus valuable in different ways. Since structure must always be inferred from some kind of contents, the protocol gives the student a chance to guess at the personality structure. Guessing is not a helpful way of being scientific. Projective tests are sometimes efficient, though indirect, tools for gathering symptoms. They may fill the structure with meaningful material but the outlines of the assumed structure remain vague or obscure.

The method of choice for the measurement of intelligence is the objective psychometric test. Since intelligence is assumed to be a dimension of a large structure, it can be assayed formally by means of objective psychometric tests. Before this is accomplished, a realistic test theory will have to be adopted and tests will have to be improved in their general design. The following suggestions are presented for the improvement of psychometric tests.

1. The contents of tests should reflect the entire gamut of major activities of a culture.
2. The assumption that a test is culture free should be rejected as presumptuous and irrelevant.

3. Objective and projective techniques may be used to supplement each other. How much the Rorschach test can contribute to the knowledge of personality structure may become evident if it is analyzed like an objective test, and vice versa, objective tests may yield projective contents if the technique is extended to elicit contents.
4. Each separate behavior sample or homogenous cultural activity may have to be measured in scales similar to those of the Wechsler Tests.
5. A scientifically optimal battery of tests may have to include between 20 and 30 different subscales.
6. Attempts should be made to adopt, as far as possible, the cultural contents of the 20 to 30 scales to each age level from infancy to advanced old age.
7. A separate battery of tests composed of 20 to 30 subscales would be desirable for each age level as follows:
    (a) at monthly intervals from birth to one year,
    (b) at bimonthly intervals from one year to two years,
    (c) at intervals of three months from two to three years,
    (d) at intervals of four months from three to four years,
    (e) at semi-annual intervals from four to ten years,
    (f) at annual intervals from eleven to sixteen years,
    (g) after age 16, the following groupings may be convenient 17 to 19 years, 20 to 24 years, 25 to 34 years, 35 to

44 years, 45 to 54 years, 55 to 64 years, 65 to 74 years, 75 years and up.

The total number of batteries (20 to 30 scales each) would be 52 for the major part of the human life span. Comparability of contents or factorial composition might render studies of growth and decline more accurate than they are now. The tasks of standardizing such batteries might engage many research workers from different disciplines on a truly national scale.

8. Each subscale should, as far as possible, contain a uniform number of items arranged in order of difficulty from near zero per cent of failure to near one hundred per cent of failures. Twenty-four items per scale may be considered optimal from the standpoint of practicality and reliability.
9. The raw score means of the scales should lie near the median of the total number of items in the scale. The dispersion of levels of difficulty below and above the mean should be roughly symmetrical. Scales lacking in sufficient heterogeneity of item difficulty and in symmetry cannot be corrected by the expedient of transmuting raw scores into standard scores. From scales so designed, the nature and degree of longitudinal changes in growth of structure and contents could be inferred with a reasonable degree of accuracy.
10. It is desirable that test scales be standardized separately for each sex. This would increase the total

number of test batteries to 104. There may not be any sex differences in intelligence. However, if it is assumed that these batteries also measure non-intellectual factors, significant sex differences may emerge. Should it become possible, as it will, to measure the non-intellectual factors in each person, it would be embarrassing to use norms from a mixed universe of widely varying scores. Example: the superiority of females in the non-general factor of language facility.

11. Each one of the 20 to 30 scales of a battery will have to be standardized on the same age group selected at random.
12. The standardization group should be roughly representative of the social group on which the tests are to be used. Special care should be taken to include members at the extreme ends of the distribution. Very superior as well as very retarded individuals in any one task should be part of the sampling. Otherwise, the group on which the tests are used clinically or experimentally will exceed the range of the normative group. Inadequate ranges of talent are one of the most serious failings of present standard tests, especially the Stanford-Binet Scale.
13. A uniform system of standard scores should be adopted for all tests and ages, preferably with a mean of 100 and a standard deviation of 20. While a change from

the conventional I.Q. and standard score systems would create some problems, it should nevertheless be given serious consideration. A more convenient system (smaller) numbers, fewer voids or dummy scores) would be:

M = 50, S. D. = 10 for general factors
M = 25, S. D. = 5 for group factors
M = 10, S. D. - 2 for specific factors

The scores of this system could be easily translated into standard scores of any level. Yet they would permit the differentiation between factors of different levels of complexity.

14. Special tests for special functions and special disabilities will become unnecessary. They are of little value anyway.

15. If four or more criteria are employed in the study of mental retardation, the most convenient cutoff points (Delaware study) for the measures of each of the criteria seem to be as follows:

   (a) One P.E. or .6745 S.D. below the mean for the mildly retarded. (25% of lower end of distribution)

   (b) Two P.E.'s or 1.35 below the mean for the moderately retarded. (9% of lower end of distribution)

   (c) Three P.E.'s or 2.02 S.D. below the mean for the severely retarded. (2% of the lower end of the distribution)

16. Adequate criterion measures for the separate age groups might be:
    - (a) the I.Q., the altitude and basal quotients (highest and lowest scores of a wide range), habit training at home, social maturity for the pre-school child.
    - (b) I.Q., altitude and basal quotients, self-care and grade placement for school age children.
    - (c) I.Q., altitude and basal quotients, grade completed and vocational status for adults.

The measures of these broad criterion groups should be properly scaled and interpreted.

17. The application of the four criterion measures would be as follows. To be judged mildly mentally retarded, a person would have to fall within the lowest 25% of the age and sex population in each one of the four measures. The limits of mild mental retardation would be from 10% to 25% of the distribution, for moderate mental retardation from 3% to 9%, for severe mental retardation from 2% downward.

Within the limits of the entire range from zero to the highest cutoff point, a person would be assigned to one of the three levels of mental retardation in the following manner:

Mild: all four criterion measures must fall within the lowest 25% of the distribution with at least one of the four measures within the range from 10% to 25%.

Moderate: all four criterion measures must fall within the lowest 9% of the distribution with at least one of the four measures within the range of 3% to 9%.

Severe: all four criterion measures must fall within the lowest 2% of the distribution.

By using the above procedure, one would reduce the frequencies of mental retardation to approximately the following levels:

(a) mild retardation, 45 individuals per 1000.

(b) moderate retardation, 17 individuals per 1000.

(c) severe retardation, 3 individuals per 1000.

(d) total number of retarded, 65 individuals per 1000.

While the prevalence of mental retardation is similar to that obtained from other surveys, the actual individuals within the retarded range established by means of rigorous criteria might be different from those selected by conventional methods.

18. A reduction in the number of criterion measures with the same cutoff points from four to three would almost double the number of individuals falling within each group. Increasing the number of criterion measures to five or more (with the same cutoff points) will reduce the number of individuals within each group according to the principle of diminishing returns. Since addi-

tional criteria are likely to be highly correlated with the combination of the original four (especially if the latter tap broad behavior samples), they will exclude a progressively smaller number of individuals from the arbitrarily set groups of mental retardation.

19. The above proposals (15 to 18) are of course provisional. Optimal groupings of the mentally retarded may be arrived at by empirical variations of cutoff points and of number of valid criterion measures applied to the population. It may be predicted that this method of identifying the mentally retarded will be more efficient than any now in use known to the presentor. It will be especially helpful in separating most of the seemingly retarded from most of the genuinely retarded.

20. It may be desirable and possible to find measures of intrascale scatter analysis which would be independent of level of difficulty and of the number of items in the test scale. It may reveal how two persons reach the same score on the same test. It may make the comparison of factor scores and scale scatter possible. Question: Do people with low capacity realization in certain areas scatter more than do those with high capacity realization?

21. Numerous refined statistical techniques are available for the study of intelligence and mental retardation. The more important ones are: scaling techniques, dis-

crimination indices, central tendencies, dispersion measures, several correlational techniques, analyses of homogeneity, analyses of variance and covariance and factor analysis.

Statistical techniques are wholly auxiliary tools and therefore cannot be used as substitutes for knowledge and logical thinking. Not infrequently, a simple statistical technique will help solve a highly complicated problem. For example, among the correlational techniques, the rank correlation method (rho) is quite helpful in the comparison of the qualitative similarity of ability dispersions in repeat tests. It reveals the degree of constancy of the entire pattern if the quantities are disregarded. It is also applicable to the study of relationships between psychiatric diagnosis and test patterns if the quantitative discrepancies are ignored.

That correlation is not causation bears repeating. While students are taught this vital precaution in a first course of statistics, behavioral scientists keep ignoring it on occasions when observing this simple rule would obviate ill-founded and unwarranted conclusions from correlational data.

Learning Experiments

Learning problems in mental retardation have been assigned to a separate section of this seminar. They will be dealt with elsewhere by contributors most competent to evaluate their significance. Only a few remarks will be made here relating specifically to the measurement and evaluation of intelligence.

(a) The field of learning theory and experimentation is one of the most vital and most developed areas of the behavior science of psychology. The laws of learning deal with an important segment of human as well as subhuman behavior. They are by implication intended to be universially applicable to all animals capable of learning. The presumed identity of learning behavior at different levels of animal life has kept interest in learning studies of individual differences to a minimum. The field is wide open for original research in applying learning theory and learning methods to groups differing in levels of intelligence. This research might contribute evidence of the accuracy or inaccuracy of generalizations derived from learning experiments.

(b) Of even greater significance would be the comparison of personality structure as determined by objective observation with learning behavior. Comparing research findings from the two fields which do not seem related at first glance may bring about fundamental improvements in both fields. There appears to be considerable similarity between personality measurement as here proposed and learning theory. This should not be surprising for human behavior is the common denominator of both fields of endeavor.

(c) Results from learning experiments carried out over a period of time in different clusters of behavior could easily serve as one of themost significant criteria of mental retardation. Indeed, the learning criterion, if properly developed, would equal psychometric criteria in efficacy and meaningfulness of level identification. Its value might even exceed the psychometric criteria as learning experiments could be performed on persons of all ages. A field that has not been touched by research!

Observations of Spontaneous Behavior

This area of research appropriately belongs to other sections of this seminar. Observations of spontaneous behavior are particularly fruitful for the following aspects of intelligence:

(1) Study of contents of experience in longitudinal perspective.

(2) Study of change of contents due to new experiences and their integration in different apperceptive backgrounds.

(3) Study of the meaning of selective responses to identical environmental situations and the resultant defenses against threatening realities, verbal, social, and spatial.

(4) Study of the effects of sudden traumas and emotional crises as compared with the effects of chronic conflict and gradual but prolonged emotional attrition.

(5) Study of inferences in regard to personality structure. To enable the observer to reach adequate conclusions commensurate with what really exists, observations would have to be systematized, scaled, analyzed, and interpreted just as in controlled experiments.

Inferences concerning structure without these aids are not likely to be either valid or reliable. Structure is too complex an entity to permit an investigator to assign the exact variances of appropriate contents to one of the many dimensions at different hierarchical levels. Furthermore, it is known that the same overt behavior sample may have different factorial communalities, and vice versa, the same factor may be related to a varied range of overt behavior manifestations.

General Strategy and Philosophy

Intelligence and the Rest of Behavior

The preceding sections of this presentation are largely confined to the problem of intelligence, its measurement, and its implications for mental retardation. Non-intellectual factors are mentioned but not discussed in detail.

The manner of presentation may leave the reader with the impression that measuring intelligence is all that is needed to understand mentally retarded individuals. The measurement of intelligence may indeed be the only crucial factor in the demarcation of mental retardation but it furnishes insufficient information about the total behavior of the mentally retarded. The mentally retarded like the mentally non-retarded display behavior signs of a non-general and therefore non-intellectual nature. These behavior characteristics are, it appears, inextricably intertwined in the existing texture of the individual organism. They may not yeild to precise identification unless and until all the other characteristics and their respective variances are identified at the same time. This looks like a hopeless task. Yet, like it or not, it will have to be attempted to build personality theory, and to understand and modify behavior.

Another important facet of personality research is the synthesis of all factors within and between hierarchical levels. The precise definition and measurement of a lone factor may not furnish as much information as may the comparative position of one factor to another. All meanings of measures of one behavior variable are strictly relative to the meanings of the measures of every other variable in the whole personality.

The structure of personality may be conveniently summarized in the following formula:

$$\begin{aligned} H = {} & fg_1^2 + fg_2^2 + fg_3^2 + \ldots\ldots\ldots fg_i^2 + && \text{(general factors)} \\ & fc_1^2 \pm fc_2^2 + fc_3^2 + \ldots\ldots\ldots fc_i^2 + && \text{(group factors)} \\ & fs_1^2 \pm fs_2^2 + fs_3^2 + \ldots\ldots fs_i^2 + && \text{(specific factors)} \\ & fe_1^2 + fe_2^2 + fe_3^2 + \ldots\ldots fe_i^2 + && \text{(error factors)} \end{aligned}$$

where H stands for the total personality variance, fg^2 for the variances of the general factors, fc^2 for the variances of the group factors, fs^2 for the variances of the specific factors, and fe^2 for the reliability variances of the measures. Only the general factors are involved in the measurement of intelligence and in the demaraction of mental retardation.

The formula resembles formulas found in the field of factor analysis. In reality, it merely provides a logical basis for the application of different mathematical designs to the study of behavior

Mathematical factor analysis alone will not yeild the desired knowledge concerning personality structure. It may help if astute hypotheses are followed by well designed experiments and normative surveys. The latter may be analyzed by statistical methods compatible with their logic. Above all, the results will have to be interpreted in terms of human behavior variables and not in terms of factorial numbers.

Intelligence and the Classification of Individuals

Psychometric measures may be utilized for many different purposes. In schools and institutions, they are frequently employed for purposes of grouping and educational classification. To examine an individual solely to assign him to a class or group is a limited objective indeed.

The significance of test results is at present very much underestimated because of inferior theories and practices. Unless all the knowledge is extracted from examinations and observations which they are capable of yielding, they may not be worth the time spent on them. The only acceptable purpose of tests should be to understand and to help. Classification per se should be a much lesser objective. If it is not, then the meaning of mental tests is grossly misconstrued. The objective may be worthwhile if the individual is educationally and therapeutically helped through the process of grouping.

Examining without therapeutic intent are worthless.

Intelligence and the Examiner

In these days of indiscriminate self-expression, non-directive therapies, and other doctrinal approaches to human behavior, it is imperative that a balance between fact and fancy be preserved. This caution applies particularly to the attitudes and viewpoints of those who are entrusted with the weighty task of examining others and of making responsible decisions about their schooling, training, rehabilitation, and life's career.

Vocational choice involves to some extent the rationalization of one's personality structure. People select a profession because its work bring gratification through the exercise of their assets and removes a sense of failure through the avoidance of personal liabilities. There are a few people in each profession who seem to be aware of both their assets and their liabilities and who try to overcome the latter through self-analysis and spontaneous conditioning.

However, in recent years the practice has become fashionable in the social sciences to attain gratification through the unchecked exercise of one's liabilities and to misuse one's assets by being fearful of one's own worth and by being threatened by the ideas of others. This trend has produced a host of difficulties in the field of intelligence evaluation and in the narrower field of mental retardation. The difficulties traceable to the selective exercise of deviant personality variables in professional groups, and especially those of clinical psychology, are worth enumerating.

(1) The selection of examining methods which are congenial only to the experimenter or examiner and the rejection of other perhaps more effective methods. This is done regardless of the relevance the selected techniques have for the problems to be investigated.

(2) The persistent subconscious projection of the examiner's failings upon the personality of the examined person, whether such projections have a verifiable basis in reality or not.

(3) The widespread practice of using abbreviated methods of examining to fit the convenience of the examiner and to accommodate his inertia without the realization that by limiting his scope of inquiry he remains ignorant and limits his chances of being truly helpful.

(4) The prevailing do-nothing attitude in the training of the mentally retarded and the exasculation of curricula of training and teaching in the public schools.

(5) The practice of psychotherapy based on contents without even minimal information and understanding of the subject's personality structure. Such psychotherapy is little more than a haphazard and expensive way of fact finding.

(6) The adoption of inflexible educational and therapeutic

orientations of questionable value to promote one's personal security rather than that of the client.

(7) The tendency to overemphasize the failings of examined persons and to underestimate their strong points. This is particularly frequent in the field of mental retardation.

These are real obstacles to the advancement of basic research and in the rehabilitation of the mentally retarded.

The careful selection and training of superior and stable professional candidates will do much to push ahead progress in research and in the solution of many practical matters in mental retardation. The field of diagnosis and therapy of the retarded can do without inferior technicians. Let's put the best brains to work to do their best jobs. Let's give a chance to men and women with sound ideas whether they wish to be organization men or not. They will soon find ways of implementing creative thought in the service of distressed human beings.

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PSYCHOLOGICAL DETERMINANTS OF MENTAL RETARDATION

Rick Heber

Introduction

Mental retardation is diagnosed on the basis of the behavioral status of the individual. Since behavior is influenced by psychological factors impinging upon the individual, it is essential that we understand the role of psychological, as well of biological factors in the etiology of mental retardation. In the pre-World War II period, considerable attention in research was directed to the question of the relative importance of genetics and culture in the causation of mental retardation. As a result of controversy created by opposing theoretical interpretation of the findings of these studies and the apparently insurmountable methodological problems encountered, researchers, in recent years, have shied away from this area of research.

A great proportion of the mentally retarded are children who derive from city slums or environmentally depressed rural areas and who present no evidence of pathology of the central nervous system. Most research attention directed toward understanding of the causes of retardation has been concerned with those factors which operate to produce the pathology of the central nervous system demonstrable in a small percentage of retarded persons. It is the thesis of this report that, from the practical point of view, a most critical goal for research in mental retardation is the achievement of a better understanding of those factors, genetic, physiologic, anatomic, and psychologic, which produce retardation in children from substandard environments who present no obvious organic defects.

Current Status of Research on Psychological Factors in the Etiology of Mental Retardation

The vast majority of studies of psychological factors in etiology have been investigations or so-called "natural experiments"; that is, studies where the researcher has taken advantage of existing differences in the environmental conditions of groups of individuals and made observations of group differences in behavior. In these studies the researcher looks, in retrospect, at the cultural and social conditions to which the individual has been exposed and may conclude the observed differences in behavior to be a function of variations in prior environmental conditions. (These investigations or "natural experiments" are as opposed to "actual" experiments in which the researcher selects a population for study, administers the experimental treatment, and observes effects.) Conclusions from these "natural experiments" must be cautious and tentative because of contamination by variables which could not be controlled owing to the retrospective nature of the studies.

Studies of the epidemiology of mental retardation.

Studies of intelligence as a function of socioeconomic class have found that the great proportion of retarded children derive from the lowest social classes. A substantial proportion of delinquents, criminals, moral deviates and recipients of charity and public welfare derive from similar conditions. Research has suggested that the pattern of intellect develops differently for children from lower than for children from middle or upper social classes. Children from the lowest socioeconomic classes tend to develop relatively better performance than verbal IQ's whereas the reverse tends to be the case with middle and upper class children, though the mean of both performance and verbal IQ's is lower for low socioeconomic class children. Fairly substantial correlations of child IQ and paternal occupation or parental education have typically been obtained. Clinical case reports and studies of groups of children have shown that dramatic progressions and retrogressions in level of intellectual functioning sometimes accompany shifts in the degree of impoverishment or enrichment of the child's environment. Other studies have shown that the greater the interval between intelligence testing and re-testing, the greater the probability of sizeable changes in test performance. Presumably, changes occurring as an artifact of the measuring instrument would remain the same regardless of the length of retest interval. Therefore, these changes are interpreted as due to effects of intervening environmental experiences.

Studies of infants reared in institutions

A number of studies have been conducted of the development of children who have been reared from birth or infancy in institutions where they have been deprived of the attention and social stimulation afforded in the usual home. Often, in these studies, little has been known concerning the intellectual and social status of the parents. Some of these studies indicate that the kind of institutional environment which provides for little other than physical care produces profound retardation in both the intellectual and personality development of infants. Studies to date have not answered the question of permamency or reversibility of deterioration: some evidence points toward dramatic improvement in functioning level when such children are shifted from radically depressed to relatively enriched enrironments; other evidence points toward a permanent crippling effect of severe deprivation in infancy.

Studies of ethnic, racial, and bilingual groups

Research on intelligence of children belonging to ethnic and racial minorities, and of children who are reared in non-

English language homes, has characteristically found below average mean IQ's in association with certain of these groups. Some meager evidence suggests that variations in characteristic modes of approach to problem-solving and in motivational structure as a function of ethnic and racial membership are present in children of pre-school ages.

Studies of children reared by foster or adoptive parents

A number of investigators have attempted to study the influence of cultural factors on intelligence through observation of children reared by foster parents. These studies have taken three forms: (1) observations of children of retarded mothers and/or socially inferior natural parents who have been reared by foster parents from birth, (2) observations of children who have been reared by parents, presumed to be retarded, for varying lengths of time prior to placement, and (3) observations of children who have been cared for in infant institutions for varying periods before foster placement. This research tends to indicate that the intellectual development of children reared in adoptive homes (usually above average) from birth is influenced by environment as well as by genetic factors. Studies of children reared by a retarded mother up to varying ages show an inverse relation between intelligence and age of separation: the longer the child lives in the home with a retarded mother, the lower his measured intelligence. This tends also to be true for children from adverse homes in general but not to the same extent. There is some indication that removal from adverse environments may bring about gains in intellectual functioning in childhood removed at younger ages, with those removed from the more adverse homes showing the greater gains.

Studies of identical twins

Researchers have attempted to study psychological influences on intellectual development through observations of identical twins (who have equal genetic determinants) reared under different environmental circumstances. The payoff of these studies has been limited owing to the small number of identical twins available for study and the fact that those separated were not usually placed in radically differing environments. In general, identical twins with small differences in environmental experiences and opportunities have shown small differences in abilities and those with large differences in experiences, somewhat more substantial differences in abilities.

Studies of the effects of education on intellectual development

Studies of the effects of education on intelligence support the notion that intelligence, as measured by current tests, reflects educational opportunities and achievement. Children of comparable measured intelligence at one age level later show differences in intelligence directly related to intervening educational experience. Conclusions regarding the effects of pre-school age educational experiences must be held in abeyance since most of the studies conducted on effects of pre-school education have utilized children from upper middle or upper class homes rather than from deprived homes. Two recent studies, however, suggest that progressions in rate of intellectual development may be brought about by pre-school education in mildly retarded children coming from impoverished homes.

Studies of deprivation in animals

Recent studies of the behavioral effects of prolonged isolation in animals have high-lighted a promising new approach to the study of psychological determinants of behavioral impairments. The exposure of animals at or shortly after weening to varying periods and types of isolation, stimulus deprivation, or atypical "emotional" experiences has been found to result in permanent modifications in learning, adaptability, and problem-solving.

Studies of the role of childhood emotional disorders in the etiology of mental retardation

Theoreticians have postulated the existence of mental retardation due to an underlying personality disorder which has interfered with the process of learning to the extent that essential intellectual skills are not adequately developed. The literature is restricted, primarily, to clinical analyses of cases which have responded to psychotherapy. Experimental evidence pertinent to emotional etiologies of retardation is virtually non-existent.

Summary

Socioeconomic class as defined by gross measures is closely related to subaverage intellectual development. Whether, and to what extent, this relationship represents familial perpetuation of inferior cultural factors as opposed to inferior genetic characteristics is not yet known.

Cultural variations in certain ethnic and racial groups are related to variations in the problem-solving skills developed, and the motivational structure related to intellectual strivings, within distinctive cultural groupings. The specific differences in the experiences of children of different ethnic and racial groups which produce these variations in behavior are not known.

There is fairly substantial evidence that prolonged exposure of infants and young children to extremely impoverished environments devoid of social stimulation produces a progressive retardation of intellectual and personality development.

The impoverishment of such environments as have been studied has usually been more extreme than that prevailing in the lowest socioeconomic classes. Just what the more subtle variations in infant-rearing practices are and how they influence intellectual growth and development remains unknown.

Removal of retarded children from extremely impoverished environments often brings about marked improvement in level of intellectual functioning. The age limits within which such changes may be effected has not been determined. Little knowledge exists relative to the degree of environmental impoverishment which must be present to produce a decline in intelligence or an upward shift upon removal from such conditions. Little is known concerning the specific intellectual abilities modified by environmental conditions, the extent to which they may be modified, or the specific components of the environment related to their modifications.

Problems of Methodology of Research on Psychologic Determinants of Mental Retardation

The numerous methodological pitfalls inherent in "natural experiments", inadequacies in available tools of measurement, and difficulties in identification of mildly retarded children at early ages have led researchers to a neglect of the issue of the role of psychological determinants of mental retardation.

Problems of retrospective studies

The retrospective studies which have contaminated this area of research have been plagued by the presence of uncontrolled variables which have contaminated data to an unknown degree and made confident interpretations hazardous. The studies of children of inferior natural parents reared by adoptive parents have been contaminated by the reluctance of social agencies to place defective-looking infants or infants of obviously retarded parents in adoptive homes without a lengthy period of observation. In the efforts of social agencies to match adoptive parent and child the principle of random assignment of subjects has been violated to an unknown degree. The placing of children of retarded mothers in infant institutions for many months prior to placement in adoptive homes contaminates the treatment (provision of an "adequate" environment) to an unknown degree. Inavailability of reliable, adequate data on natural parents of children reared in adoptive homes is another factor which has clouded interpretation of findings on foster-child intelligence. Perhaps the most serious indictment of the "natural experiments" (particularly those dealing with children reared by retarded mothers, institutionalized infants, and children reared in adverse environmental circumstances,) is that the subjects of these studies have been the parents and the children who have been brought to the attention of legal or social agencies. It seems quite likely that such groups may differ from the general population of low socioeconomic class or retarded parents in respects related to the variable under study.

Difficulties in manipulating environment

Actual experiments on the relationship of psychological variables to development of intellectual skills have been well nigh impossible. Such studies would of necessity involve extreme manipulations of environmental treatments and control over mating, procedures impossible within the legal and moral framework of our society. Morally acceptable positive manipulations of environment for large population groups would involve huge sums of money which communities are generally unwilling to expend in view of the uncertainty of benefits. For these reasons animal research, where extreme controls and manipulations are possible, may be an important adjunct in the study of environmental determinants. While results of animal research may not be applied directly they may be most helpful in generating hunches which are, in turn, capable of being researched with humans.

Problems of measurement

Many of the problems of research on psychological determinants of retardation are related to the lack of adequate tools of measurement. For the most part, measurement has been restricted; on the side of child behavior, to a general intelligence test (IQ) score, and on the side of environment, to a gross rating based on the occupational, educational, or moral status of the parents. Our current general intelligence tests apparently sample primarily the kinds of intellectual processes related to school achievement and tend not to correlate as highly with non-school aspects of social functioning. With restriction of behavioral measurements to a single (IQ) score the relationship of other important (non-school) aspects of behavior to environmental variables has not been determined. The low reliability of infant testing and the low correlations of infant (IQ) scores with those obtained in later childhood has led to concern over whether changes in test score reflect real changes in the intellectual level of the child, or are an artifact of changes in the nature of the measuring instruments. Research evidence (primarily from factor-analytic studies) indicates that a single (IQ) score can in no way represent the great variations in behavioral skills subsumed under "intelligence". It is evident that adequate research on psychological determinants must await the development of adequate measures of specific intellectual skills (only six factorial studies of intellect using preschool age subjects are reported in the literature), and measures of environment sensitive to subtle variations in experiences and opportunities.

Problem of identification

Prospective studies of the early life development of mildly retarded children without demonstrable organic damage are exceedingly few. These children are typically not identified until they enter school. Pre-school age children who come to the attention of community agencies are those who are more severely retarded or are mildly retarded children with concomitant handicaps. Researchers who have canvassed "door to door" in efforts to identify these children at age 3, 4, and 5 have met with little success. The mildly retarded identified at these ages tend to be those with organic disabilities or emotional handicaps. These experiences lead to a concern as to whether the children in the population testing in the mildly retarded range at age 3 are indeed the same children who test as mildly retarded at 9 or 10. One approach to the problem of early identification of mildly retarded children for longitudinal study would be through study of the pre-school siblings of retarded pupils in special classes. These children might be designated as "high-risk sibs" since correlational studies indicate a high probability of their following their older brother's or sister's footsteps once in school regardless of "early" test performance.

Research Strategies

Development of tools of measurement

Research has demonstrated conclusively that general intelligence test scores are influenced by conditions of the environment. More pertinent to formulation of an adequate theory of intellectual development which can account for development of intellectual deviations is the question of which specific intellectual skills are influenced and to what extent by what specific components of the environment. Research bearing on this question must await the development of more adequate and refined measures of intellect and of environment. Tools must be developed to measure the many specific intellectual skills and techniques devised which will measure the subtle variations in the environment of children belonging to varying social, economic, and education classes and ethnic and racial groups.

Studies of the development of intellectual deviations

In reviewing the research literature in mental retardation one is struck by the fact that not a single, comprehensive longitudinal study of the growth and development of intellectual deviations is reported. In the vast group of mildly retarded children deriving from substandard environments and presenting no demonstrable pathology of the nervous system - when in their development do intellectual disabilities become evident? In what specific aspects of intellectual functioning does the disability first become apparent? Does the disability first appear in discrete form and later become pervasive? Does the differentiation of intellectual skills progress in the same fashion as in the child who develops average or superior intellect? To what extent may these intellectual disabilities be remediated with early identification, and by what techniques? One approach to these questions would be through longitudinal studies of the growth and development of intellectual skills in (1) pre-school (high-risk siblings of mildly retarded pupils of the subcultural type), (2) pre-school children from low socioeconomic backgrounds who do not have an older retarded sibling, and (3) pre-school children from middle socioeconomic backgrounds. Coincident with observation of intellectual development, measurements of subtle variations in environmental experiences should be taken, in order that these variables be correlated with intellectual development.

Studies of the trainability of intellect and prevention of psychologically determined intellectual disabilities.

To the extent that intellectual retardation is a function of psychological aspects of the environment, prevention or remediation should be effected through psychological intervention. Studies of efforts to prevent intellectual retardation is "high-risk" children and to remediate intellectual disabilities in pre-school retarded children through various training techniques or "enrichments" of the environment will add to knowledge of the importance of social-cultural factors in etiology. Recent studies have suggested that pre-school age identified retarded children may be accelerated in their intellectual development through provision of a pre-school program. It would be interesting to determine the degree to which the appearance of retardation may be prevented in "high-risk" children through provision of pre-school enrichment experiences. The few efforts to date to facilitate the development of intellect in culturally deprived retarded children have intervened with single treatments (e.g., nursery school experience, parent counseling, etc.). It would be more productive, perhaps, in initial studies to use a "total push approach" to environmental intervention by moving far beyond the school's normal sphere of operation and into the home where all of the child's waking hours can be enriched.

PERSONALITY CONCOMITANTS OF MENTAL RETARDATION

William I. Gardner

Introduction

Most research in mental retardation has focused on the relationship of intelligence (in the narrow sense) to variables pertaining to behavioral status or response to treatment. Little attention in research has been directed to development of personality characteristics of retarded children or to the relationship between personality variables and behavioral efficiency of the retarded child.

Recent research in general psychology, however, was highlighted the relationship of personality variables to problem-solving skills. This research suggests that consideration of the role of personality variables cannot be ignored in any group of persons with impaired problem-solving or adaptive abilities. Prevalence studies of severe behavior disorders, psychoneurotic and psychotic conditions are consistent in revealing that these disorders are far more frequent in populations of retarded persons than in the general population. Research on the causes of social-vocational failure of the adult retardate points to a lack of relationship to IQ and to the more direct relevance of various personality factors. Studies of institutional placement reveals that one of the most important factors precipitating institutionalization is the presence of behavior problems. These and similar observations give relevance to the study of personality characteristics of the mentally retarded.

Status and Problems

In reviewing the studies relative to personality variables involved in the functioning of the mentally retarded, one is impressed by:

1. The small number of studies conducted.
2. The relative absence of theoretical models giving direction to the research conducted with the result that there is little basis for integration of results of studies.
3. The variety of procedures used in evaluating the personality variables under consideration.
4. The difficulties encountered in attempts to use measurement techniques developed for use with a non-retarded population (projective, self-report, interview behavior rating, etc.)
5. The lack of attention to multiple determinants of the behaviors under consideration.

As a consequence of factors such as these nothing of a definitive nature can be said about significant personality variables which are characteristic of various groups of mentally retarded persons. From some studies it could be concluded that the retardate has a low frustration tolerance, high anxiety level, unrealistic self concept and level of aspiration and is characterized by rigidity of approach to problem solving. Other studies report observations and conclusions which are in disagreement with these descriptions.

It becomes evident from these and similar results that personality research with the mentally retarded is in an exploratory stage of development.

The problems of personality research do not differ in kind from the problems characteristic of similar research with any group of human subjects. Since the general problems are well known to anyone in the behavioral sciences, no attempt is made to enumerate these. Brief attention will be given, however, to a few problems which appear to be of particular significance to research endeavors with the retarded.

Problems of measurement

Personality research in mental retardation is hampered by the lack of reliable and valid techniques and procedures of assessment. In studying the personality characteristics of non-retarded persons the following procedures are used:

(a) self report inventories

(b) projective techniques

(c) observational techniques, including both ratings by parent or other relevant adult and behavior observations by an outside observer

(d) interviews

Most of these, especially the self-report procedures and projective techniques, cannot be utilized in typical fashion with the retarded as a consequence of low verbal ability (reading and speaking). In response to projective techniques there is typically less verbal production and more simple enumeration of the content of the pictorial stimuli. It has been suggested by some writers that the mentally retarded, more so than the non-retarded, are influenced by immediate environmental and experiential factors. Consequently, responses to projective materials would be less indicative of underlying personality influences. The general questions of reliability and validity of projective procedures are further confounded by these factors when used with the retarded.

The following examples are presented to illustrate the difficulties of personality assessment of the retarded. In one recent study of a group of institutionalized retardates (CA 9-7 to 18-7; MA 3-6 to 9-10) projective tests employing both animal and human pictures were used. It was concluded that "The retarded S's stories were most often simply enumerative of what was on the card." The retarded in comparison to normal and disturbed children of school age "....took longer on any given card and eventually produced fewer words per card or protocol." Just how the words which were produced could be interpreted represents a significant question relative to validity.

In another study of the self-concept of elementary-age mildly retarded children, the statement was made, "mentally retarded S's did not always immediately understand the import of the rating scales and were aided by the examiner, after suitable probing, in making their ratings. Average and bright children were given assistance only upon request." The influence of the probing and assistance of the examiner on the ratings made by the retarded subjects is unknown. One is not surprised at the finding that the reliability of the self-concept measures of the retarded was lower than that of the non-retarded Ss.

It does appear that any techniques, presently available or to be created, depending upon the verbal responsiveness of the retardate will be of limited value, especially in work with the retarded child. As suggested by Gallagher the development of more refined observational procedures represents the most fruitful approach to the measurement and description of personality variables.

Brief description of a study which is presently being conducted will illustrate another type of procedural problem. This study has as its purposes the investigation of the relationships of psychogenic and psychosocial factors to the intellectual, maturational, learning, and social adjustment characteristics of the mentally retarded. Samples of mildly retarded institutionalized children and adolescents are being studied. The effect of early emotional experiences on these four aspects of the retarded will be determined _by measuring the maternal attitudes toward specific child rearing practices_. Presumably the attitudes will be obtained through interview with the mother. Such retrospective reports by mothers of good educational and intellectual characteristics have been found to be highly unreliable. One could hardly expect that the mother of the cultural familial retardate could provide information which would be any more adequate.

Description of subject sample

In most research reports, little information descriptive of the subject sample studied is given beyond the usual MA, CA, and IQ levels and the environmental placement (special class, institution, regular grade). It is not surprising that of groups matched on certain of these variables, one study may conclude that the subjects tended to be anxious, aggressive and non-compliant with little interest in school work while another group is described as "reasonably happy, acceptant of self and others and motivative." Before such descrepant behavioral descriptions can be understood, much more must be known about the subjects used in the studies. This problem, while present in all areas of mental retardation research, is particularly significant in personality research since so many environmental and experiential factors can influence the behavior of the subjects under investigation.

Problems of developing useful constructs

An acute problem which personality research with the mentally retarded shares with other research endeavors in the behavioral sciences is the development of clearly defined terms and constructs for standardized use by researchers investigating similar problems in the related areas. As long as researchers use such language as "psychodynamic principles", "conflicts between overt and covert levels of inter-personal behavior", "emotionally defined along a phlegmatic-labile dimension" (all terms taken from research with the mentally retarded) and do not define these objectively or operationally, there can be only limited progress in this vital research area.

In studying the personality characteristics of the mentally retarded no assumption should be made that one is dealing with a species separate from the non-retarded. In research efforts one should not attempt to discover a unique personality descriptive of the mentally retarded. Such an approach would be of little consequence, especially since the mentally retarded population is composed of individuals differing so widely along so many different physical and psychological dimensions. Again, it is our belief that major concern of future research should be limited to the identification and understanding of those personality characteristics of the retarded which function to interfere with his optimum adaptive potential. This interest is just as relevant to those whose retardation has an organic basis as to those with a presumed psychological or psychogenic origin.

Approach to Investigation

The approach to the study of the significant behavioral emotional characteristics of the retarded is not different from the approach followed in studying any other group of people demonstrating characteristics which create special social problems. In studying the problems of the delinquent, the physically handicapped or the neurotic, for example, an attempt is made to identify those characteristics which appear to underlie the difficulty, to relate these to other characteristics of the individual, and to delineate the conditions under which, and the processes by which, these characteristics developed. The same general approach should be followed in researching the significant personality variables involved in mental retardation. Such questions as the following should be raised: "What are the behavioral-emotional characteristics which preclude vocational-social adjustment of the adult retardate? What are the[1] characteristics of the school-age retardate which interferes with his school success and accounts for his interpersonal or social difficulties? What are the characteristics of the preschool child which render it unlikely that he will be accepted by his nursery group peers?

Once the significant behavioral characteristics have been identified, the crucial problem of the genesis of these factors must be researched.

In this effort, three general sets of factors appear to be most relevant as having causative significance. These factors are presented with brief examples of the types of research questions which could be raised in each area.

(a) Presence of central nervous system damage in many retardates. How are the behaviors related to the nature and extent of the damage present? Considerable attention has been devoted to an analysis of the psychological concomitants of central nervous system damage occurring in an adult. Little is known of the direct and indirect consequences of damage existing from birth or an early age.

(b) Presence of a reduced level of intellectual capacity with the consequence that the child is frequently unsuccessful in meeting the expectations held by various segments of the retardate's environment. How does the retardate respond to this inadequacy? It has been suggested that the retardate has an unrealistic level of aspiration. Is this a direct function of a reduced intellectual level or does this represent a psychological adjustment mechanism?

On the surface it would appear that the considerable amount of failure and rejection that is so frequently an aspect of the retarded person's experiential background would exert an adverse effect on his development. The few studies conducted in the area of success and failure do suggest that the performance efficiency of many retardates is hampered by a low expectation that his efforts will lead to success in problem solving. To what extent is this a factor in his general inadequacy? What are other consequences of this inadequacy?

The retardate is frequently described as being impulsive, reacting to momentary influences without adequate consideration of the consequences of his behavior. How much of this behavior is a direct consequence of the intellectual impairment and how much might be a more direct function of poor ego development and regressive-defensive reactions developed as a consequence of a peculiar set of influences present during the early formative years?

(c) Presence in the history of the majority of the mentally retarded of a grossly substandard early home and family environment. It is evident that the early experiences provided the retardate are quite different from those provided most non-retarded members of our society. Sarason hypothesized the following as characteristic of the early child-rearing practices provided by the subcultural mother:

> More concerned with own than with child's needs, has negative or indifferent attitude toward child, does not fondle, caress or play with child, provides no consistent or immediate response when the child is distressed, is inconsistent in feeding schedule and behavior, spends little time with child, and gives little encouragement to the development of a variety of verbal and motor behaviors.

If these practices are representative of the experiences provided the retardate, what relationships exist between these and the development of various personality factors? Obviously, there is a need for intensive study of the interaction between parent and child during the early childhood.

The obvious approach is that of comprehensive longitudinal studies. This type of approach has been described earlier in relation to the study of intellectual development. The study of personality development should be an aspect of the same study.

LEARNING, MOTIVATION AND PERCEPTION

Harold Stevenson and Edward Zigler

An Overview of Current Research

The areas of learning, motivation, and perception are three of the classic areas of experimental psychology and consequently are among the most highly developed in methodology, conceptual sophistication, and theory construction. Research workers in mental retardation who have entered these fields have both profited by and suffered from the previous extensive work. The designs, statistical analysis, and other formal aspects of their research are among the best in the field of mental retardation. It appears, however, that investigators have been unable to avoid the temptation of relying too heavily on the earlier work with animal subjects. Consequently, they have sometimes rather mechanically translated research designs developed in animal studies to their investigations of the mentally retarded. Although creative applications of the methods and results employed in animal studies to the study of the retarded may yeild valuable information, it is unlikely that great progress will occur through the unimaginative translation of problems from one type of population to another. Such investiations meet the methodological requirements of good research, but add little to our understanding of mental retardation.

In addition to utilizing methodology which was developed for research with other types of subjects, investigators have tended to restrict their research to problems relevant to the populations investigated earlier. As a result, research has dealt with a narrow range of problems. For example, operant conditioning and discrimination learning have been studied to a far greater degree than such topics as complex learning, higher mental processes, classroom learning, and problem solving in social situations.

The mechanical translation and limitation of problems had resulted in the tendency to conceptualize the retarded child as sharing the psychological characteristics of lower animals. With this orientation, the research has been directed at the discovery of the differences between the behavior of normal and retarded subjects and less concern has been shown for the similarities in the behavior of normal and retarded individuals. It is clear that retarded individuals do not form a discrete group possessing characteristics not found in normal individuals. Since the intellectually retarded form the extreme of a continuous distribution, they should be considered as sharing in various degrees the characteristics found in the normal and superior segments of the distribution.

A major trend in general behavior theory is the consideration of learning, motivation and perception as integrally interrelated processes. This trend has not been reflected in research with the mentally retarded, for studies with the retarded have tended to investigate these as discrete aspects of behavior. The failure to consider the motivational determinants of learning in the retarded has made many of the studies difficult to interpret and has restricted the generalizations that can be made from them. It is apparent that retarded individuals have motivational structures which differ from those of other persons because of their intellectual deficit, atypical social experiences, and particular environmental histories. Learning and perceptual studies which do not attempt to deal with motivational processes make it impossible to determine whether the atypical performance of retarded subjects reflects differences in learning and perceptual processes or differences in motivational structure. For example, recent reevaluations (Gallagher, Ellis, Osborn) of earlier studies indicate that some of the differences in performance reported between normal and different types of retarded subjects may be more parsimoniously explained by differences in motivation than by differences in perceptual and cognitive processes.

A significant feature of research in mental retardation is that, with the exception of the rigidity concept emanating from the work of Lewin and Kounin, no theoretical position has emerged from research dealing with the learning, motivational, or perceptual behavior of the retarded. The present theoretical status of research in mental retardation is characterized by an eclecticism with a facade of theoretical sophistication. There has been an attempt to short-circuit genuine theory, construction since the empirical stages in the development of concepts concerning mental retardation have been avoided.

One of the requirements of theory is that it deal with and in fact be developed within the area in which the theory is to be employed. Theoretical concepts must be developed inductively and their interrelationships must be specified before the conceptual network embodied in a theory can be evolved. The tendency to apply portions of such theoretical positions as those of Kohler, Rotter, Spence, Hebb, and others has stood in the way of development of theories or models which generate an integrated body of research with retarded individuals. A high value has been placed upon research derived from theory. This has deterred researchers from undertaking empirical research yielding the required data from which the inductive bases for theory construction might be developed. The over-enthusiastic utilization of the particular aspects of general theories which have some relevance for the behavior of retarded individuals has added to the tendency for research with the retarded to be narrow and to avoid some of the problems associated with mental retardation. There are practically no observational studies of learning, motivation, or perception in the retarded. These types of studies have been of value in increasing understanding of the behavior of non-retarded persons, and appear to be a necessary step for the development of theoretical considerations of mental retardation.

Conclusions

In assessing the current status of research in the areas of learning, motivation and perception several characteristics of the research with mentally retarded subjects are apparent. First, the extensive background of research in these areas has resulted in both advantages and disadvantages for the researcher in mental retardation. The primary advantage is the availability of well developed research methodology. The primary disadvantage is the tendency to apply the problems and designs of research with lower animals to investigations of the behavior of retarded individuals. Second, the interrelationships among learning, motivation, and perception has not been realized by researchers in mental retardation and the research unrealistically has tended to deal with these as unrelated processes. Third, there has been premature emphasis on theoretical sophistication and, as a result, portions of existing theories have been applied to behavior of retarded individuals. This has deterred attempts at constructing theories of behavior which focus on the mentally retarded. The result of these shortcomings has been to make work with the retarded narrow, fragmentary, and unimaginative.

Current Promising Research

Although the conclusions just discussed generally characterize current research in this area, there are many studies which hold promise of opening new areas of research, of yielding information about practical problems in treatment and training of the mentally retarded, and of providing data from which theoretical positions might be developed. In this section, examples of such work will be presented.

There has been a series of recent studies investigating the relative significance of CA, MA, and IQ for learning in retarded individuals. From such studies information is being obtained concerning the effects of the experience and physical maturation associated with CA, the cognitive development associated with MA, and the relationship between the two. It is possible from such studies to obtain a more comprehensive interpretation of the consequences for learning when intellectual level is incommensurate with chronological age. It is obvious that the ability to predict the behavior of retarded subjects will be increased by the specification of the relationship between experiential factors and mental development. This specification will be possible only when subjects are matched on more than such global measures as CA and MA. Such variables as etiology, past histories, and specific aspects of intellectual functioning must eventually be considered in matching groups of subjects.

There have been several recent investigators reevaluating behavioral differences in learning and perception between familial and organic retardates. The results have revealed smaller differences than those previously reported. This work suggests that the nature of intellectual deficit does not differ between the two types of individuals to the degree previously believed, and that differences in performance previously found may be related to differences in motivational structure. Recent studies have shown that familials tend to be drawn from a narrow portion of the general population, while organics are drawn from a broader segment of the general population. Thus, class differences previously found in general learning and motivation undoubtedly operate with retarded children. The literature on social class provides insight into the types of controls which are appropriate in studying different types of retarded individuals.

A concept which has had tremendous influence in generating research for nearly 30 years is that of rigidity, or behavioral stereotype. This concept was utilized in an effort to deal with observed behavior in retarded individuals, and has been of significance not so much for its validity as for the large number of studies which have been stimulated by it. The concept has been employed in each of the areas under consideration. These studies are especially significant for they have shown that the often observed behavioral rigidity of the retarded is multiply determined by such factors as intellectual level, institutionalization, past history of success and failure, type of reward employed, and relationship with adults. Further investigations of the antecedents and consequences of rigidity would appear to provide a fruitful path to the construction of a more comprehensive theory of retarded functioning.

Another promising body of research in mental retardation is the recent work being done in comparing the performance of institutionalized and noninstitutionalized retardates. Usually, comparisons have been made of institutionalized retarded and noninstitutionalized normal subjects. It is impossible from these latter studies to determine the relative contribution of institutionalization and retardation to the learning and motivational differences found between the two groups of individuals. Institutionalization has been shown to affect the relative efficacy of various types of rewards for modifying behavior, the reluctance of retarded individuals to become involved in adult-initiated tasks, and the differential affectiveness of supportive adults on different types of behavior. Such factors have forced a reevaluation of the nature of mental retardation independent of the effects of institutionalization. Attention must be paid continuously to the problem of sampling in studies of institutionalized individuals. Consideration must be given not only to effects of institutionalization itself, but also to the selective factors which may operate in determining what types of individuals are institutionalized.

Associated with the work on the effects of institutionalization are the recent studies concerned with the preinstitutional history of retarded individuals. An inordinate amount of social deprivation is found to be commonly experienced by the institutionalized retarded. This deprivation has significant effects on performance in a variety of tasks and on the effects of institutionalization as well.

Recent general work has indicated that the ability to perform complex learning tasks is closely related to the ability to utilize verbal cues. Luria has emphasized the deficiency in the use of verbal cues by the mentally retarded and has advanced this as the basis for their learning difficulties. Although few learning studies have been done which experimentally manipulate the degree to which verbal cues can be employed, they appear to provide extremely valuable information about this possible deficiency in the retarded. It would be of great significance to know whether the learning process of retarded individuals is characterized by this difference in utilization of verbal cues, and whether such a deficiency might be compensated for by the utilization of other types of cues, such as those provided by the motoric system. Research in this area may also be important in discovering the basis for the discrepancies often reported between the verbal and performance scores obtained by retardates in conventional intelligence tests.

There have recently been many different approaches to the investigation of the motivational characteristics of the retarded. These have centered primarily around the concepts of anxiety, achievement, and developmental changes in motivation for different types of incentives. Performance in learning and perceptual tasks has been found to differ with the strength and type of motivation operative. As previously noted, an understanding of the retarded has been hampered by the failure to consider the contribution of motivational factors to performance. For example, the high level of anxiety of retarded children may play as significant a role in their learning as low mental age. An understanding of the significance of different types of rewards for normal individuals of different developmental levels as well as retarded individuals is necessary before a comprehensive evaluation of the contribution of motivational differences to differences in learning and perception will be forthcoming.

Recently, the effect of stimuli from the physical environment on the behavior of retarded children has been investigated in a series of studies concerned with distractibility, activity level, and curiosity. Studies of these types provide information concerning the differential effects of external environmental stimuli on behavior as a function of intellectual level. One of the common characteristics ascribed to retarded children is a short attention span. Retarded children are said to be distracted by peripheral environmental stimuli. Investigations of the validity of such a proposal and of the variables which influence this characteristic have immediate value for the understanding and learning of perceptual processes in the retarded. Most of the studies have been concerned with demonstrating differences between retardates and normals in their sensitivity to environmental stimuli, rather than dealing with the antecedents of such behavior.

Acquisition of information when the individual is not in a formal learning situation is highly dependent upon curiosity.

Investigations of curiosity in the retarded should provide information relevant to the problem of their learning potential. Closely related to curiosity is incidental learning, or learning without awareness. While earlier studies were concerned with the demonstration of the existence of incidental learning in retarded children, current studies are investigating the variables which are significantly associated with performance in such learning tasks. These studies give further information about the effects of peripheral stimuli on the behavior of retarded subjects.

Conclusions

The discussion above does not provide a complete coverage of the recent work in learning, perception, and motivation, but does offer examples of work which hold promise for increasing our knowledge in these areas of retarded functioning. It is significant that most of these studies are in their initial stages and have only begun to scratch the surface of the problems being raised. There is a myriad of meaningful research problems which could be undertaken in these areas. It is of considerable significance that many of these areas are being explored by relatively young research workers who give every indication that they will continue to do important work. There is no need to overemphasize the exciting possibilities in these areas for new research people entering the field

Research Possibilities for the Future

A review of current research being done in retardation indicates that there are many types of problems and many approaches to research in learning, motivation, and perception which are not being adequately pursued. In this section some of the more important studies will be indicated and their significance for the field will be noted.

Sensory and perceptual thresholds

In contrast to the exploitation of previous work in learning, there have been practically no attempts to study many of the classical problems in sensation and perception with retarded populations. There are no developmental data concerning threshold changes in most sensory dimensions and little is known about differences in sensory and perceptual discrimination associated with intellectual levels. The highly developed psychophysical methods provide research tools which could result in rapid development of this area.

Social motivation

It is often noted that there is a large discrepancy between the conceptual and social behavior of the retarded. The retarded individual may function quite adequately in social situations and be greatly retarded in conceptual problems. The basis of such a discrepancy has not been explored. Research is needed to provide important information about the unevenness of function of retardates exemplified in its extreme form in the behavior of idiot sarvants.

Comparative studies of learning

Most investigators have studied only one particular type of learning problem with the retarded, and no studies of the interrelationship among learning rates for different types of problems have been undertaken. It would be desirable to know whether some common factors associated with the learning process of retardates could be isolated and whether these factors differ from those in normal individuals. Some of the newer factor analytic approaches also make it possible to investigate the intra-individual variability often found with learning tasks.

Motivational determinants of the IQ

It is not uncommong for large changes in IQ to be reported for retarded individuals. Most interpretations of these changes have been in terms of changes in intellectual stimulation. It would be of value to know whether motivational changes might not also be related to these changes in IQ. Administration of IQ tests involves a social interaction and the motivation of retarded individuals to interact with and to please adults may be of significance in determining IQ level.

Cognitive styles

A literature has developed in both perception and learning indicating that there are differences in cognitive styles resulting from inherent and experiential factors. These differences have been found to account for a great deal of the inter-individual variance in perceptual and learning performance. No studies have been done to determine whether there are, for example, differences in the field-dependent and field-independent tendencies of retarded individuals nor whether there are unique cognitive styles characteristics of retarded individuals.

Requirements for adequate social adjustment

Until the minimal requirements for adequate social adjustment in contemporary society are known, it is impossible to know how to influence the motivational structure and experience of retarded individuals so that they can function in a socially competent manner. It is clear that IQ alone is not enough to determine whether adequate social adjustment will occur and other factors, including motivation, need to be explored. Recent work focusing on the social competence concept appears to hold promise for workers in mental retardation.

Automated teaching

There have been few studies of the effectiveness of automated teaching with the retarded. The whole problem of the development of programs for teaching the retarded has been left unexplored. The study of programs which are effective with the normal individuals and those which are effective with retarded individuals may cast light on the similarities and differences in the learning processes of the two groups. The unique motivational problems associated with the introduction of teaching machines raises another interesting area of investigation.

Developmental studies

Little is known about the developmental sequences of perceptual, learning, or motivational processes in the retardate. No one has investigated whether the total developmental sequence is the same as that found in normals. It is not known whether retarded development is a truncated version of normal development or whether many current approaches to developmental problems, as exemplified by the work of Werner, Gibson, Piaget, and Pinard, which provide normative information and instruments useful in the study of the development of the retarded.

Observational studies

Scientific advance occurs through both experimental and observational studies. There are types of information which cannot be obtained in experimental research which are of great value in understanding behavior and in generating concepts which can form the basis of later experimental work. The observational approach has been neglected to the disadvantage of our understanding of mental retardation. It would be highly desirable to know more about retardates' natural social interaction, everyday problem solving, recognition of familiar objects, classroom behavior, play, and the natural appearance of such types of behavior as sympathy, aggression, and dependency.

Retention

Acquisition of information is hot helpful to the individual when the information is not retained. It is possible that the poor performance often noted in everyday learning by retardates may be due in part to deficiencies in short-term and long-term retention. Relatively little attention has been paid to the study of memory in retarded individuals. Investigation of this problem and of variables that may play a significant role in determining the degree of retention should be of great value in improving attempts to produce lasting changes in their behavior.

Conclusion

The areas of perception, motivation, and learning are three of the most basic aspects of behavior and it is obvious that no complete picture of retarded behavior can occur until these areas are more completely explored. Work in these areas appear to be quite heterogeneous, ranging from relatively sterile replications of animal research to some novel approaches. These areas are exciting ones in the field of mental retardation for they are represented by a group of investigators who are in an advantageous position of having good training and vigor. The beginnings have been made. Future developments will depend upon the degree to which both routine and novel approaches are supported.

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TREATMENT

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Introduction

It is a special problem of research concerning treatment of the mentally retarded that the objectives or goals of the intervention must be specified. Treatment in this context refers to all relevant educational, social, cultural and medical therapies.

Goals or objectives have arbitrary character. Practically considered, however, they are set, at least in gross form, by consensus -- in the form of philosophy, social policy and values. Present views in our society are that every individual should be given opportunities to develop his potentialities no matter how limited such potentialities may be.

It is the problem of the retarded that they have difficulty in varying degrees in mastering even the basic tools of their culture. For some, life options will exist only within the limits of extremely sheltered environments. For higher grade retardates, eventual assimilation in open society is a reasonable goal.

It is the province of research to provide information that will make treatment procedures for the retarded most effective and economical in terms of time, energy and cost. Contributions have been made in various treatment areas with varying degrees of success.

It is our goal to explore the present status in research, to suggest more effective ways of conducting research in treatment, and to highlight fruitful areas for study.

A Framework for Considering Research Problems in Treatment

We have found it useful to think of research problems in treatment in three major categories, as follows:

1. Research on Differential Placement
2. Selection for Treatment
3. Content of Treatment

In the following sections, a brief description of each of the three categories is provided.

Research on Differential Placement

The problem in research in this category are those relating to placement or allocation of individuals to treatment when several methods of treatment are available. To neglect the retarded is itself a kind of treatment. The development of practical forms of treatment is a large and continuing task which should occupy the attention of the most creative individuals we can attract to this field.

Research in this category is always experimental. It is concerned with the relative effectiveness of the several systems or agents of treatment. This research must be of such design as to consider factors of individual differences and their interaction with systems of treatment.

Research in this category is oriented to placement decisions rather than selection decision, as these terms have been used by Cronbach and Glesser. At this point, it may be well to make a distinction between "placement" and "selection" as used in this paper. When only a single treatment is considered and a limited number of individuals is to be assigned to the treatment, the decisions are of "selection" type. If several treatments are available and the problem is that of optimal allocation of all individuals of a given population to treatments, the decisions are of "placement" type.

Variables used in "selection" may or may not be useful in "placement" decisions. IQ or MA may predict equally well within each of several systems of teaching. Other variables will be needed to help choose between the systems for indiviudal placement.

The design of research on differential placement is the same when considering general or gross differentiations such as institutional vs. special class placement and more specific differentiations such as those involved in chemotherapy, psychotherapy or language training.

Selection for Treatment

In considering selection, one has in mind a single agency or treatment. The problem is one of making selection-rejection decisions so that individuals chosen for the treatment are those who will profit most or contribute most.

Two common errors may be made. Individuals may be rejected who in fact would profit from the treatment (false negatives) and others are selected who cannot profit from the treatment (false positives). There is need for careful studies in all varieties of agencies and programs on instruments and procedures of selection if we are to reduce such errors.

In the course of treatment, it is necessary to maintain accurate and current status information on all individuals so that selection for other programs can be made at the most appropriate time.

Content of Treatment

What should we teach the retarded? What experiences are likely to be useful? What treatment methods or agents have significant effects? What characteristics of teacher behavior are related to achievement of students? For present purposes, research into these kinds of questions is considered to be in content. Research in this area is especially dependent upon adequate formulation of goals.

Research under this rubric involves identifying, creating and shaping materials and methods basic to a system of treatment, and assessing them for applicability in achieving goals for the retarded. It may be concerned with gross organization of a long-term training program or even of buildings, or it may involve shaping methods of producing a vowel sound. Methods of research will vary from primitive procedures such as pooling opinions on curriculum to vigorous experimentation on the efficacy of a drug. Much of what is needed will not be found by research in the traditional sense but through the insightful development of materials and procedures which then may be checked for relevance by research.

Assessment of Current Status of Research

Excellent summaries of research on treatment are now becoming available in such publications as Review of Educational Research; the Encyclopedia of Educational Research; reports of the Cooperative Research Branch, U.S. Office of Education; Research Monographs of the Council for Exceptional Children; reports of the Office of Vocational Rehabilitation; American Journal of Mental Deficiency and others. Some comprehensive reviews are known to be currently in manuscript stage. While it is unnecessary to duplicate this effort here, brief summary comments are offered, to acquaint the reader with the general status of the field.

Status of Research on Differential Placement for Treatment

Problems of differential treatment have been studied in a wide variety of agencies and over a broad range of degrees and types of retardation.

Studies of individuals and groups have demonstrated that intensive individual tutorial systems have more merit than group teaching systems. These studies have lacked the tools that would help to indicate the factors underlying the results, e.g., motivation, attention and learning characteristics. Research in the classical areas of learning, perception, and motivation will hopefully remedy this limitation.

Research with groups has sought to determine whether homogeneous grouping of the retarded is more profitable than heterogeneous grouping, e.g., special class vs. regular classes. The research results are much in dispute. One might conclude from a majority of the studies that retardates receiving treatment along with their normal peers fare better in achievement, social adjustment, and personality development than do those in segregated settings for the retarded, however, these studies suffer from glaring errors in design which render the results questionable. These errors in research methodology are discussed in a subsequent section.

Studies to ascertain the advantages of special class treatment of severely retarded children have not established that such classes make any significant contribution to the development of these children. Some studies suggest that special class treatment is superior to home treatment but the results are so vitiated by inadequate instruments for evaluation that they are not impressive. Whether contributions to the welfare of parents should be a criterion in evaluation of programs for severely retarded children is at issue. Studies in this area suffer from many of the methodological errors found in analogous studies on higher grade retardates.

Research on the effects of early treatment indicate that intensive treatment with very young (3 to 5 years old) retardates is advantageous in both community and institutional settings. Again, the factors basic to the results have not been fully ascertained. To some degree, etiology has been shown to be relevant; there appears to be greater increment to the non-neurologically impaired. Results indicate that some of the negative influences of substandard environment can be reversed to a degree.

Studies of the performance of both institutional retardate released to community life and former special class subjects have not established a definite relationship between any specific kind of treatment and later successful adjustment. Certain characteristics of individuals are known to have at least minor predictive value.

Status of Research on Content

Research in content areas in education comparing retardates with normal peers has shown that the retarded require a prolonged and intensive readiness program; that they respond to the traditional approaches in teaching methods, i.e., phonics vs.

visual, with about the same degree of variability as the total school age population; and that they are somewhat inferior in certain aspects of academic learning, i.e., make relatively more errors of certain types in reading. Extensive literature is available on such topics.

Remediation in communicative disorders has received limited attention as a research area. Studies in this area are very recent and indicate that much has yet to be done in refining sampling procedures, therapeutic techniques and evaluational methods.

Studies in motor ability indicate that retardates are inferior to normal peers in a broad variety of activities, however, activities studied are not necessarily related to any specific educational program. It was further shown that retardates can profit from the same kind of motor experiences as their peers but that they need considerably more practice. The major deficiencies in these studies arise from lack of control of such factors as motivation and comprehension of instructions.

Research in subject matter areas such as art, health, music and social studies is noteworthy by its absence.

Status of Research on Selection for Treatment

Much research on selection has centered on practical problems of screening and identifying the retarded for special

classes. Much of this research has been concerned with the development of screening devices, the criterion being performance on the WISC, Binet or some comparable instrument. Major weight is given to results on individual intelligence tests in making special placements in the schools. Only rarely has the adequacy of this procedure been tested. General intelligence tests yield only a modest prediction of school success. It is apparent that multi-variate procedures are needed. In any case, the traditional predictive model is not fully sufficient for the kinds of decisions to be made.

In programs for so-called trainable retardates it is common to establish criteria for selection in terms of self-help skills, ambulation, simple communication skills and motor skills, as well as general intelligence. Moderate progress has been made in showing which selection variables are useful. Problems of instrumentation have been very great.

The small amount of research so far done on admission to institutions shows first admissions tend to be young low-grade retardates and high-grade adolescents with social pathology and/or dependency problems. As communities establish special classes for the high-grade retarded, rate of instituttionalization from these communities tends to decrease.

In institutions having large numbers of high grade patients there is continuing interest in selection of individuals for

release. The base rates of success and failure in such populations are sometimes about equal. Such populations are especially attractive for research on components of social and vocational adequacy. Studies on selective release to open community life show measured intelligence may be important but certainly not of over-riding importance. Work habits, absence of disabling social behavior, communication skills and motivation are of importance. Conditions of placement such as adequacy of supervision will obviously account for some of the variance in post-institutional placement success but such matters have as yet received little study.

Research in Content

School programs and curricula have been developed in many schools, institutions and parent classes. Similar activities to generate programs and curricula are in evidence in occupational training centers and sheltered workshops. Rarely have such programs been evaluated experimentally. In many instances the materials have been so specific as to be useable in only a single community but there are instances of programs and curricula which are broadly useful. The many projects in this field now receiving support have developed to meet service needs but seem to be relatively unproductive as research ventures thus far.

Methodological Problems and Proposed Solutions

Research in Differential Placement

Research in this area can be categorized into two areas. There are (a) comparative studies of administrative units and (b) comparative studies of pedagogic systems. Studies of special class versus regular class placement is an example of the first area. An example of research of the second area would be classroom teaching vs. use of teaching machines.

In comparative studies of administrative units, methodological problems are frequently observed in the specification of the purpose of the study, in the treatment or content aspects of the study, and in the analysis of the results.

One major problem has been failure to be fully explicit about the criterion to be used for the evaluation of results. Another has been failure to give advance consideration to facts of population accessibility with the result that some studies have been peculiarly curtailed or distorted by sample bias. A crucial failure in some studies has been the lack of appropriate instrumentation.

A further difficulty in research on comparative effects of administrative units is the frequent confounding of effects of staff, curriculum and other critical variables. It is often difficult to separate the factors contributing to the results.

One can conceive of elaborate designs which would begin to separate these effects but the practical problems make such designs difficult to execute. In these circumstances the researcher who does experimental comparisons of administrative units is obligated to provide full description of all conditions of his research, especially details of treatment procedures and staff characteristics. Only with this kind of full description is it possible to replicate the study and to begin to understand limits of generalization.

Another frequent error is the disregard of individual differences and their implications for differential placement. It is not enough to determine the general merits of one system of education of training as opposed to another. Knowledge about the nature of retardates and the factors impinging upon retardation, sparse though they be, indicate that it is futile to attempt to generalize treatment procedures across the entire spectrum.

It is important for the researcher to extend the analysis of data beyond testing for mean differences. He should seek interesting affects between methods and relevant variables.

One of the more persistent errors in studies of various administrative plans is to compare groups of subjects and staff previously selected by the treatment agency for its own proposal.

Experience has shown that such ready-made samples will be different on important variables. For example, children already selected for special classes are very likely to be different from children with comparable IQ's who are in regular classes. They probably are lower in achievement, differ in socio-cultural background, and exhibit more behavior problems. An attempt is sometimes made to equate such groups retrospectively and to circumvent the selection factor by matching them on certain personal, social and achievement variables. This, however, placed unwarranted reliance on existing measurement devices and human observation.

The solution is to be found in prospective studies using an untreated population from which samples may be drawn. Since present knowledge does not indicate the extent to which variables are relevant for matching or control, complete randomization in sampling is indicated. Proliferation of studies neglecting these design principles has been wasteful and misleading.

Research in Selection for Treatment

Because research in selection techniques is in a formative stage, few methodological problems in past research have been evident. A discussion of problems of this kind is presented in a subsequent section.

Follow-up studies of former clients of a treatment procedure in an agency of institution represents a beginning stage in some types of predictive research. The major purpose of such studies is to bring to light characteristics that appear to be highly correlated with "adequate social adjustment", or some similar criterion and to incorporate these into predictive devices. The critical variables thus identified may also be analyzed for amenability to instruction and thus suggest changes in the treatment program.

One major problem in follow-up studies arises from the fact that they are retrospective. The usually inaccurate and/or inadequate information about the client prior to and during treatment raises questions as to whether the characteristics correlated with adjustment were antecendent to or by-products of the treatment.

Follow-up studies are further vitiated by methods of comparison. Typically, either retardates are compared with normal peers from the same general treatment setting, e.g., a public school, or they are measured against what is considered to be modal or normal behavior for their total community. Thus, the researcher has sometimes failed to consider that his results reflect variations in mobility, socio-economic status, and value systems rather than the effects of treatment. Such phenomena as variations in community tolerance for deviant behavior are disregarded.

Again, the solution to these problems is to be found in long-term prospective studies where actual relationship between characteristics, treatment and adjustment can be ascertained through the continuous collection of data in the course of the study.

The study of the retardate in a social setting should be an analysis of his performance within his environment and within the value system typical of his environment. Behavioral norms should be representative of those within the circumscribed life space of the retardate.

Research in Content for Treatment

Research on the development of curricular for education, social and occupational training, and rehabilitation is still at a descriptive stage. One major methodological problem is the establishment of a clear structure of content so that generalization from one locale to another might be possible.

Projected Approaches or Strategies

Studies Seeking Interaction Effects

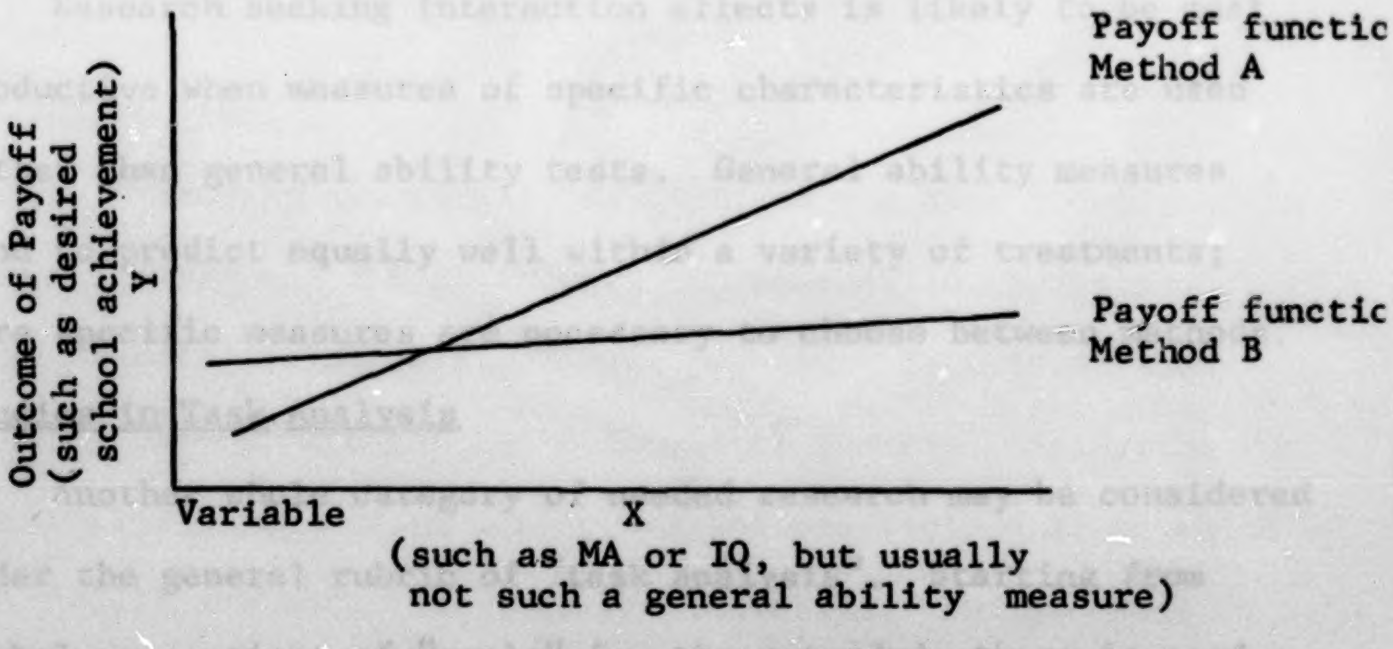
Important ideas for projection of research on treatment have been provided by decision theory. (See Cronbach and Gelser) We refer especially to the distinction between "selection" and "placement."

Cronbach has pointed out that, ".....neither the traditional predictive model of the correlator nor the traditional experimental comparison of mean differences is an adequate formulation of the decisions confronting the applied psychologist. Most day-by-day decisions of the practical worker involve placement of subjects so as to maximize outcome. Studies showing interaction effects in varied treatments will be most useful for such decisions.

The strategy required may be represented in simple form as in Figure 1 below.

Figure 1.

A simple illustration of research design seeking interaction effects



In Figure 1 the payoff or desired outcome is represented on the Y dimension and some presumably useful variable (on which all subjects have been measured) on the X dimension. Two methods of treatment (A and B) have been employed. The differential in payoff functions is represented by the difference in slope of lines representing the relationships between X and Y. In the present case it may be seen that the difference in mean outcomes for the two methods of treatment is negligible. The intersection of payoff functions (lines) and their difference in slope indicates possible usefulness of the findings in making 'placement' decisions; that is, in allocating individuals to method A or B to maximize payoff. The strategy proposed here is applicable both to a very gross differentiation in method, e.g., non-directive vs. supportive counseling, and to details of treatment methods, e.g., phonic vs. visual methods in reading instruction.

Research seeking interaction effects is likely to be most productive when measures of specific characteristics are used rather than general ability tests. General ability measures tend to predict equally well within a variety of treatments; more specific measures are necessary to choose between methods.

Studies in Task Analysis

Another whole category of needed research may be considered under the general rubric of "task analysis". Starting from global conceptions of "goals" for the retarded, there is need for analyses to specify major components of treatment or education such as curriculum and training programs. From this analyses it is then necessary to specify the elements of content and to undertake research on learning or treatment. Stolurow has suggested techniques of "task analysis" and their application to research on learning of the retarded. The work of the Clarkes and others on analysis of tasks in vocational training provide practical illustrations.

Much work is needed to analyze complex goals and tasks to the point of identifying what Stolurow has termed "natural units", and then to identify relevant methods of treatment. For example, basic or pure research on discrimination learning, will, to some extent, suggest ways of teaching "natural units".

In the whole area of task analysis there is much need for cooperative efforts by practical workers and researchers. Such cooperative work should help to bring the fragmented research of experimentalists into a practical and comprehensive context.

Predictive Studies

Business and industrial institutions and even schools often select individuals for their very own specialized purposes. Their concern is for institutional pay-off. Individual and societal pay-off are not their immediate concern. Selection for institutional pay-off is done by making predictions as to which individuals are most likely to be productive. The probability that the retarded will be productive often is considered to be low and as a result the retarded are rejected all too regularly. Some of the retarded will produce very well, but technical procedures for selection are too imprecise to differentiate these good prospects.

It is of great concern to agencies serving the retarded that the population they receive is thus often formed by default rather than by systematic means. It is inescapable, that many institutions will continue to operate to maximize their own pay-off and it is clear that they often reject the so-called retarded too readily. All varieties of attitudinal problems and misconceptions of retardation contribute to the technical problem of selection.

One type of research needing improvement is that of a straightforward predictive type. If it is possible to be more precise in prediction of 'success' in these various institutions, we can hope that both selections and rejections will be made more equitably.

A special problem of prediction arises from the fact that a new type of post-school or post-institutional facility has become available in recent years. In the past, the retardate was either placed in a socio-occupational setting in the community or he was not. Today, agencies such as the school, institutions, and rehabilitation services have one more alternative; the sheltered work setting. The availability of this setting has not detracted from the aim toward placements involving maximal independence. This has complicated prediction problems by offering another avenue for allocation.

Research in the correlates of "adequate social adjustment" are needed. Present day systems of observation and retrospection are not sufficient. The research of sociologists and the social psychologists in social structure and social types will likely be critical to the break-through on this problem.

Studies on Clinical Methods of Teaching

When confronted with a detailed profile or diagnosis of abilities and other characteristics of individuals, one has a problem of deciding upon a strategy for teaching. Should one build upon "strengths" to concentrate upon overcoming "weaknesses?" No simple answers to these questions should be anticipated. There is vast need for clinical studies to test the usefulness of diagnostic schemes in formulating specific teaching procedures. Research on language is beginning to show how detailed diagnostic procedures are useful in formulating specific teaching methods.

Studies of Interactions in Group Settings

Typically, research in learning of the retarded has been a study of the individual in a setting where the potential for learning has been maximized through the control of variables of environment and conditions of learning. While it is recognized that this is a necessary state of research it is not sufficient. In practice, much treatment goes on in group settings where the interactions between people and things are multifarious. We need to know the nature and extent of interactions and the resultant impact on learning. Which interactions enhance learning or detract from learning in what kinds of individual?

Studies Relating to Assimilation of the Retarded in the Community

Many employers, parents, neighbors, teachers and others carry unfortunate attitudes and false information into their relationships with the retarded. Continuing studies of such attitudes and misconceptions are needed. Means for educating the public about the facts of retardation need to be developed and tested.

Research on Psychotherapy

The retarded have emotional problems analogous to those found in the general population. There have been many misconceptions concerning the amenability of the retarded to psychotherapy. Some recent studies indicate that the outlook in this field need not be so bleak as commonly judged in the past. Systematic work is needed to develop this treatment resource for the retarded.

Studies of Professional Problems

The competency of personnel, both lay and professional, who work with the retarded is of crucial importance in treatment programs. Research relating to recruitment, selection, retention, training and supervision of personnel is much needed. One potentially fruitful area of research at this time concerns pre-service and in-service training of institutional attendants. Another area of extreme importance is teacher selection and training.

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ADMINISTRATION AND RESEARCH

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Introduction

Underlying this report is the assumption that administrative matters are critical in the conducting and advancing of research. Administrative planning and support factors should be considered as carefully as the research design and the problems under study. As Hobbs has suggested, any analysis of research, its status and potential, which does not include "the strategy of program planning, of financing, of administration, and of creating a climate in which that rarest of minds, the creative scientist can grow and flourish", is unrealistic. (AJMD, 64, 9, 1959, p. 299).

A review of events during the last ten years related to research in the field of mental retardation reveals that many hopeful administrative steps have been taken. For instance, fiscal stimulation by the federal government, particularly through the programs of the National Institutes of Health and the United States Office of Education, and the Office of Vocational Rehabilitation, has greatly strengthened training and research in mental retardation. Voluntary organizations, such as the National Association for Retarded Children and the American Association on Mental Deficiency, have played important roles in encouraging research and demonstration. A few pioneer states have initiated centers for research at institutions for the mentally retarded. The rate of gain in research activity made possible through combined resources at national, state and local levels is impressive. However, lest one be mislead, the actual resources available for research today fall far short of what is justified in view of the size and complexity of the problem.

An underlying problem in financing research in mental retardation is the fact that many persons in positions of influence and responsibility still wonder if monies should be expended on the retarded members of society. Such persons are among those who argue that funds can be more productively spent on programs for gifted children, on military build-up, on foreign aid and a host of other causes. Any and all such causes have their import for the welfare of the nation. However, it is hoped that people in decision making positions will not overlook their moral and economic responsibility in meeting the problem mental-retardation poses for everyone.

Masland underscores the extent and gravity of the problem when he concludes on the basis of a recent survey of research in the field that, "It is unlikely that in this country there is any form of disability which equals the impairment of mental ability and in respect to its toll of economic uselessness and human misery." (AJMD 5/58 p. 991) But understanding and helping the mentally retarded does not rest solely on emotional and economic costs. Through studying individuals who are deviant much has been added to the understanding of human behavior as a whole. Thus the total population stands to gain from research focused on mental retardation.

There is still a more fundamental reason that mandates continued study in this field. In a democratic society, every individual is conceived as having worth and dignity. Through sponsoring research, along with health and welfare programs, society affirms its convictions in this philosophy.

Professional workers have the obligation of calling attention of those in decision making positions to these needs and problems and providing them with the best available information.

However, in urging research, a note of caution must be sounded lest we raise unjustified expectations. Keppel's remarks regarding the field of education pertain as well to mental retardation. He observes among the public, as well as some members of the profession, "an eager desire for results - fast, dramatic, tangible results - that are most improbable..." in the field that is "....as complex and as little understood." (Am Beh Scts 4/61 p. 24) Margaret Mead similarly thinks that, "This country believes - and I am talking about the general climate of opinion that affects the fund-giving bodies, the fund-voting bodies - that any research on something you can't change is not only hopeless, but almost bad." (AJMD, 9/59, p. 254).

The problem of maintaining a rational equilibrium is acute not only in pressing for research support, but also in disseminating research results. "Time suspended judgment - waiting until the relevant facts are in - becomes increasingly difficult under these circumstances and the temptation to announce results prematurely becomes progressively stronger. There is the haunting danger that too hasty action may result in short-changing the next generation. Just as serious is the danger that irresponsible or misleading claims may lead to public and professional disillusionment and resistance to further change and experimentalization. The proper balance between enthusiasm for a new idea and the exercise of suspended judgment about it must be found and must be expressed to the public and the profession." (Keppel, Am Beh Sctct, 4/61, p. 24).

The field of mental retardation will best be served if exponents realistically indicate that research consists of "... painstaking investigation based on carefully formulated statements of problems and assumptions, with constant evaluation of of results and consequent restatement of hypotheses in the light of actual findings." (Keppel, Am Beh Sctst, 4/61, p. 24) Gains under these circumstances, all must understand, will be small if viewed in any calendar year but in sum they can become appreciable over a decade, a generation, a century. In place of a magic formula for remaking the handicapped individual, research holds out the eventual hope of maximizing the potential of the individual no matter what his mental level.

If these ends are to be realized the full range of biological and behavioral sciences will need to be utilized. In this regard, it is believed that fund granting agencies should give particular attention to arousing and recruiting scientists from disciplines which thus far have remained relatively inactive in the field. With concerted effort at all levels it is conceivable that a time will be reached when mental retardation will be an integrated field of study for the related basic sciences and the practicing disciplines. When this is attained, there will no longer be the need for designating funds specifically for research in mental retardation. For the present, however, there is continued need for focusing resources in this problem area. Without such support, much of the momentum gained during recent years in the field of retardation is apt to diminish greatly.

In meeting the concerns and principles emphasized above, certain conditions come into the foreground which we believe require administrative action. For the most part, they are not unique to research in mental retardation. In some instances, the actions required are imperative and should be undertaken within the immediate future. Others realistically cannot be realized for some time, but nevertheless are believed worthy of preliminary consideration at this time.

Taken as a whole, the recommendations fall into four categories: developing conditions which will foster research careers; facilitating collaboration among researchers on broader and more integrated basis; developing more substantial financial support for research; and raising and maintaining research standards.

Career Development

Shortage of research talent is well recognized as a critical problem in the area of mental retardation. Hobbs has stated "....it often seems that...we should devote almost all of our resources to training, so short is the supply of component research personnel." (AJMD, 2/59, p. 238). We likewise view the shortage of research personnel in the area of mental retardation with some alarm. Potential research projects often await the availability of personnel, other projects suffer from inexperience of understaffing, and still others are terminated because of the difficulties of retaining personnel. Experienced administrators of research institutes often express the opinion that talent is the greatest problem in research development. Even more than other problems - e.g., facilities, funds, availability of subjects, etc. - the shortage of talent hampers the regional development of research programming.

The main question, then, is where are additional able, inquiring research minds to be found? Acknowledging that there is a finite supply of talent and that the competition for this supply is great, the seminar members propose that some additional processes of encouragement must be employed. The purpose should be to train or locate talented researchers and to maintain them in productive research.

One method is to encourage undergraduate and graduate students to prepare for career opportunities in mental retardation. This recommendation could be implemented through the establishment of fellowships, following the precedent of other fields such as mental health, vocational rehabilitation counseling, and veterans rehabilitation where special priorities have been acknowledged.

Secondly, career development should be encouraged through post-graduate, career, and senior research fellowships. Research workers or potential researchers are often deterred from undertaking research or preparing grant request for research projects because they cannot find the free time and the energies to move through the initial phases of formulation. Research cannot be approached superficially. The accomplishment of the levels of sophistication needed for significant research cannot be accomplished on the fractionated, part-time basis that clinical, teaching, or administrative personnel have to give it.

Thirdly, as a further inducement to full-time research activities, universities and service agencies should establish tenure appointments for career researchers in mental retardation. The researcher, at present, is frequently an itinerant worker who moves from one grant to another and has no tenure or established role beyond the limit of a grant period or a fellowship appointment. Such conditions are hardly conducive to researchers who wish to establish career roles for themselves and homes for their families. Policies should be maintained which establish the career researcher on an equal footing with his academic colleague.

Fourthly, funds should be made available to centers conducting research in mental retardation to include research training where there has been demonstration through prior investment that the dual function of research and training can be maintained. This should be done with the proviso that the project director and staff work with the university in developing high standards for the training. The objectives of such training should be to expose the candidate to the full range of research activities as a participant in the same sense that a clinical trainee is a fundamental part of a clinical program.

The prior recommendations are advanced with confidence that if the supports are provided they will signal a change in the general attitude about the retardate and will remove the "hopeless" label from this important area of research. The supports will then have provided important inducements for the development of research careers in mental retardation.

Facilitating Collaboration

This section is an acknowledgement that in addition to the efforts of the individual researcher there is need for a more complex form of organization for research in mental retardation. The form this organization takes may often depend upon the unique features of local policy or administrative organizations. Nevertheless, we would predict, in general, that encouragements for collaborative efforts between disciplines and agencies at all levels - local, state and national - would facilitate research in mental retardation. We further postulate that certain standard features of these cooperative and interactive arrangements can be identified and encouraged.

One evidence of collaboration at the local level is the formation of a research center. A center may come into being through the efforts of professional people who find that by working together in some arrangement they can establish the means for more effective research. It is often derived from a combination of research and service interests, as they seek to establish a common identity, and funds and staff for implementing studies of problems with which they are concerned. Obviously, some questions can best be answered by pooling the literature, the research tools and methods, and the clinical-educational techniques and insights of workers from several disciplines and experience backgrounds. The development of centers is viewed as crucial to the development of research in mental retardation. The basis for this assumption is found in the diverse and complex nature of the area.

Important aspects of research must take place where children and adults are trained, treated or otherwise provided for. While it is important that research centers have a university affiliation, they should be located in or near hospitals, institutions, or relatively large public schools so that facilities and subjects will be readily available. Some research centers are operating effectively in spite of distance barriers, however, states planning new facilities for the mentally retarded should consider placing them near universities or other research facilities.

A second form of collaboration is that provided by clearing-house services. These are conceived as including collecting and distributing research materials, pooling of data, maintaining instrument pools, and providing advisory services. On the national scale, the U.S. Office of Education has taken measures to facilitate the exchange of research reports and summaries of projects it has sponsored. Another example of such an operation is the Technical Project of the AAMD. The scope of the task, however, is beyond that which existing resources can encompass. Furthermore, it is conceivable that more limited clearing house services may be appropriately assumed at the state and unit levels. However, when agencies contemplate establishing such services, it is important that they determine whether or not the task is already being performed.

A third collaborative activity would involve personnel from several local, regional, or national agencies who would team up to increase the scope or the potential for an undertaking beyond the reach of a local research center. In the preceding reports of this seminar a number of problems requiring such combined efforts are suggested. The collaborative project might involve several universities, institutions, agencies, or a combination of these arranged in such fashion that a comprehensible treatment will be given to a major problem in mental retardation. Additional grant funds are likely to be required when such undertakings are arranged.

Developing Financial Support

Research relevant to mental retardation has been financed in many ways. Since it is a social problem affecting many individuals and agencies in our society it would seem logical that financial support might be expected from diverse sources. As stated earlier, endeavors connected with mental retardation have had low prestige value. Some have questioned the efficacy of concentrating time, equipment and talent on the solution of problems relating primarily to mental retardation when there are many other pressing problems facing us which they believe have a greater potential for paying off. Fortunately there is evidence that the public is becoming more aware of the benefits which may accrue from making a concentrated, frontal assault on the problem. While support now is being given research in mental retardation is encouraging, it believes that progress which has been made to date justifies the commitment of additional funds to the enterprise. Several courses of action might be taken to finance research more adequately in areas relevant to mental retardation.

First, universities should be encouraged to place a higher value on research activities which have relevance for mental retardation. The academic community has tended to place a low value on research and other programs related to the area. It should not be forgotten, however, that a number of universities have provided the time and the intellectual climate necessary for various individuals to make outstanding contributions in the field of mental retardation. If they assume the responsibilities outlined earlier for training research workers and co-sponsoring research centers, it is obvious that additional funds will be needed.

Second, it would seem reasonable in view of the size of the problem to expect continuing financial support from the federal government. Funds provided to date have served to increase interest and productive work in the field. However, additional support will be required in relation to suggestions that have already been made, particularly for collaborative and programmatic research which transcend state and local responsibilities. In order to augment appropriated federal funds it is recommended that a portion of the total amount be set aside for distribution to the states on a matching basis.

Third, one of the most promising sources for new funds appears to be the state and local governments. Only a handful of states are directly supporting any research in mental retardation. Yet, as Hobbs observes, "it is the state governments that stand to gain most from the new knowledge that would reduce the incidence of mental deficiency and improve the adjustment of the retarded in society." (AJMD, 9/59, p. 237). The fact that state and local governmental units bear the major cost of programs for the retarded should be a strong talking point in securing legislative sanction of appropriations for research in mental retardation.

Fourth, another group that deserves attention consists of the national membership organizations. Of these, NARC and AAMD are to be commended for research demonstration projects they are sponsoring and promoting. There are many other national organizations concerned with child welfare, family counseling, child guidance, recreational service, to mention but a few, who are still overlooking the research responsibility in any field, let alone that of mental retardation. A concerted effort should be made to encourage these organizations to designate a portion of their funds to research.

Fifth, foundations have played an impressive role in financing the growth of scientific knowledge in our country. Unfortunately, little support for research in mental retardation has been obtained from them. This is another untapped resource which should be cultivated by those involved in the administration of research.

Finally, another problem is bringing the researcher in contact with his source of financial support. Much time and effort can be spent by the individual scientist in a quest for support because of a lack of know-how in approaching funding sources. Some help is provided by universities, governmental agencies, and organizations like the American Foundation Information Service. In the field of mental retardation the Technical Planning Project of the AAMD acts to some extent as an information service. This project will soon expire and then individuals in the field will have no central source to turn to with questions concerning financial support. It is believed that the AAMD should be encouraged to take further leadership in the development of clearing-house services.

It might also be well for various agencies such as the U.S. Office of Education, National Institutes of Health, private foundations, etc., to consider taking a more active role in referring to other sources promising research they cannot support. In addition, staffs of public and private funding business should consider getting together to examine ways of standardizing application procedures, minimizing administrative detail and facilitating exchange of information among them.

Raising and Maintaining Quality

There is a need for upgrading the quality of research. Further administrative measures designated to increase quality must be counterbalanced by additional safeguards designed to assure academic freedom and individual prerogative of the research worker. We believe that these prerogatives will also act to produce better quality and quantity of research in mental retardation. Consequently, we have attempted to provide a set of recommendations which will facilitate gains in both directions.

First, recognition must be given to the role that universities play in maintaining and influencing the standards of excellence in research. They are the molders and inspirers of students today who are to become the scientists of tomorrow. To accomplish this task fully, universities require faculty of high caliber, an adequate pool of outstanding student applicants, and sufficient facilities to provide well designed learning experiences.

Some proposals having a direct bearing upon university programs, i.e., recruitment, fellowships, and practica, have already been made. Substantial support for such cannot be urged too strongly.

Second, the field should avoid over-centralization of the decision making function of awarding grants in the area of mental retardation. This might be done through the establishment of regional advisory or reviewing committees either as preliminary or as final reviewing bodies relative to grant applications. Such dispersal of function would make for greater familiarity with the identity of the researcher, with the potentials of the setting, and with the productivity of the on-going operations as a basis for evaluating applications submitted.

Third, while advisory committees generally include leaders in various fields of research, it is believed that they should have the services of subcommittees of technical experts, Such study groups could provide the respective boards with a firmer basis for judging the application, though a more thorough evaluation of the applications in the light of current advances in the particular area of the proposed study. As suggested above, these subcommittees might be organized on a regional basis.

Four, standards used by advisory and technical committees should be evaluated frequently, and the results should be published so that the scientific community may react to or be guided by them. In this way the standards could serve as guidelines for the preparation of research projects and could serve to up-grade the quality of projective studies. With frequent review, both researchers and reviewing committees may become committed to research orientations which are or have been in fashion and thus become blinded to other approaches which hold promise. Placing criteria followed and actions taken in the open forum should serve to advance the views of the researchers and the reviewing bodies.

Five, advisory and technical committees must be given sufficient time to evaluate carefully the research proposals upon which they must make decisions. Rating devices may serve the convenience of a committee called upon to pass judgments upon scores of applications in a single day, but it is questionable if they provide an adequate basis for prediction. New approaches to evaluation and selection must be devised if greater validity is to be expected. The ultimate aim, of course, is to select for support that group of grant applications which will give the greatest yield. The previous reports included herein can assist advisory committees determine which areas of research endeavors are likely to lead ultimately to important break-throughs in the complex field of mental retardation.

Six, portions of funds should be specifically allocated for the support of new institutions and new individuals who appear to have potentials for research in mental retardation. The objective should be to increase the number of settings and the number of researchers who are engaged in the broad frontal effort to explore into the numerous unknown of this complex social problem.

Seven, priorities established by the different funding agencies should logically provide a balance of support for both applied and basic research. Although, as Hobbs (op. cit) has stated, basic research is more prestigious, there is little reason to suppose that it is more valuable. The best model for research support, therefore, would include both laboratory and field studies; basic studies with little or no immediate application as well as studies which can be immediately utilized in planning treatment or training; long range programs of extended scope as well as small scale projects of shorter duration; and finally, studies initiated by experienced researchers in well recognized setting as well as by unknown researchers in submitting this front research application.

Eight, it is believed that a more realistic approach to setting the beginning dates for projects is indicated in the case of some granting agencies. Research directors often are forced to initiate projects before they have had time to hire and orient staff, organize the setting, and make appropriate adjustments in their own work schedules. In such cases the quality of research completed during the support period would have been better if there could be a sufficient period of time between the approval announcement and the starting date for the project support so that the essential tooling up could have been completed before the formal phase of the study was undertaken.

Nine, rejected research proposals represent a fertile area of work for agencies interested in up-grading research efforts on a national scale. Even if all research studies submitted did meet the rigors of research acceptability, existing funds, or for that matter, anticipated funds, could not underwrite them all. Today, a majority of the applications fail to secure financial support. As one example, the Cooperative Research Fund currently approves but one-fourth of the projects submitted. With minor modifications, many of these applications might be improved and resubmitted. In other instances the potential researcher should be guided to develop another project proposal. In any event, the majority of applications should not be left without explanations. It is acknowledged that to deal with each of the rejected proposals on a personal basis could be an excessive drain on resources of funding agencies. Hence some selective procedures will undoubtedly be required.

Ten, researchers who are among the select minority receiving support also require additional attention by the granting agencies. Some grants give considerable latitude to the researcher in modifying his study as the process evolves. Others require rather strict adherence to the blueprints originally submitted. The state of knowledge in the field of retardation is such that it is frequently difficult to foresee what may transpire in the course of experimentation. One possible resolution would be for granting agencies to have sufficient technical staff to provide for site consultations where requested or otherwise indicated. These staff members would have the authority to approve modifications as dictated by conditions obtained in the course of the study.

Eleven, the extension of time provided for the analysis and reporting of the data would also be likely to improve the quality of reported research. Analysis that is hurried or unduly compressed in time may result in an inferior reporting of the available data. In many instances where staff is secured only for the term of the project and then dispersed without ample time for data analysis it is doubtful if the full significance of the data will ever be obtained.

Postscript

The emphasis placed on fiscal issues in the preceeding section may lead one to believe that the advancement of research in mental retardation is dependent upon the expansion of funds. While more funds are needed, money alone cannot produce the desired advance. Increases in fiscal support of research in the field must be closely related to the availability of qualified personnel to develop and undertake the studies and suitable facilities within which to conduct them, and above all to creating a climate conducive to scientific inquiry. To develop an adequate reservoir of scientific personnel, recommendations have been made to establish conditions which will foster research careers.

As the build-up in research resources is attained, attention to maximum returns becomes increasingly imperative. Recommendations for greater emphasis on programmatic and collaborative research have been made to cope with problems which appear to be outside the capabilities of individual studies of limited dimensions. With spurts in growth, vigilance is also necessary to assure that standards of research activity are not only maintained but that they continue to advance.

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